

**JOINT
STATE/FEDERAL
MITIGATION BANK
REVIEW TEAM
PROCESS
FOR FLORIDA**

**OPERATIONAL DRAFT
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Joint State/Federal Process Development Team

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SECTION 1 - Fundamental Requirements of Mitigation Banks

FUNDAMENTAL REQUIREMENTS OF MITIGATION BANKS in the State of Florida

The following are the minimum requirements that will be used by the Mitigation Bank Review Team (MBRT) during their initial evaluation of all mitigation bank proposals. It is important for prospective bankers to take note that mitigation bank proposals failing to meet any one, or more, of the following requirements are not likely to receive federal or state authorization as a mitigation bank.

Pursuant to Chapter 373 Florida Statutes, and the Federal Guidance for the Establishment, Use and Operation of Mitigation Banks, the applicant must provide reasonable assurance that the proposed mitigation bank:

- 1) will improve ecological conditions of the regional watershed;
- 2) will provide viable and sustainable ecological and hydrological functions for the proposed mitigation service area;
- 3) will be effectively managed in perpetuity;
- 4) will not destroy areas with high ecological value;
- 5) will achieve mitigation success;
- 6) will be adjacent to lands that will not adversely affect the perpetual viability of the mitigation bank due to unsuitable land uses or conditions;
- 7) will meet the requirements of all other applicable state or federal law;
- 8) will be implemented to ensure that any surface water management system constructed, altered, operated, maintained, abandoned, or removed within the mitigation bank will meet the requirements of state and federal law;
- 9) applicant has sufficient legal or equitable interest in the property to ensure perpetual protection and management of the land within a mitigation bank; and,
- 10) can meet the financial responsibility requirements prescribed for mitigation banks.

It should be noted that the Florida MBRT discourages the establishment of a mitigation bank based solely on exotic plant removal. This is due primarily to the inability of a bank of this type to adequately compensate for the loss of a suite of wetland functions which normally occurs at an impact site.

SECTION 2 - State/Federal Mitigation Bank Review Team Process

STATE/FEDERAL MITIGATION REVIEW TEAM PROCESS FOR FLORIDA

1. This section describes the joint State/Federal process for the evaluation of wetland mitigation banks in Florida and should be used in conjunction with the attached flow diagram. This process was developed cooperatively by the following agencies:

- U.S. Army Corps of Engineers, Jacksonville District (Corps)
- National Marine Fisheries Service (NMFS)
- U.S. Fish and Wildlife Service (FWS)
- Environmental Protection Agency (EPA)
- Natural Resources Conservation Service (NRCS)
- Florida Department of Environmental Protection (DEP)
- St. Johns River Water Management District (SJRWMD)
- South Florida Water Management District (SFWMD)
- Southwest Florida Water Management District (SWFWMD)

2. **Background:** In February 1994, the DEP and WMDs issued rules for wetland mitigation banking. State recognition of a mitigation bank is through issuance of a Mitigation Bank Permit. In November 1995, the Corps, NRCS, EPA, FWS and NMFS jointly issued Federal Guidance for the Establishment, Use and Operation of Mitigation Banks (herein referred to as the "Federal Guidance"). A key point of the Federal Guidance is that proposed mitigation banks should be evaluated by an interagency Mitigation Bank Review Team (MBRT). Federal recognition of a mitigation bank is through a Mitigation Banking Instrument (MBI) signed by the federal MBRT members and the Banker. Therefore, a mitigation bank in Florida should have both a State permit and a Federal MBI (a Corps construction permit may also be necessary). The goal of the MBRT is to obtain consensus on issues related to the establishment, use, and operation of the banks under review. The State/Federal interagency team developed the MBRT process for Florida in order to streamline the respective evaluation processes and reduce redundancy between the State and Federal reviews.

3. Applicability:

a. **General** - The MBRT process is a Federal requirement for the evaluation of mitigation banks. The process described herein is based on the procedures described in the Federal Guidance with some minor modifications to allow consistency with State review procedures. The MBRT process is a true joint State/Federal coordinated pre-application phase. However, once the State application has been formally filed and is deemed complete, differing regulatory requirements may not allow for true joint processing to continue. Nevertheless, the interagency team believes it is to the advantage of all parties to participate in the MBRT process because it provides a mechanism for maximum interagency coordination with minimum logistical

complexity. It is anticipated that this will contribute to quick and consistent agency determinations in a cost effective manner.

b. State applicability - Participation in the MBRT process by prospective Bankers is voluntary for the purposes of obtaining required State approval or permits. The MBRT guidance document is not a part of the regulatory requirements or review procedures of the State agencies nor is it intended by the State agencies to be a rule or statement of general applicability. Although participation in the MBRT process will likely streamline the State review process, approval by the MBRT does not constitute or guarantee a State approval or permit.

4. Agency Roles: At the Federal level, the Corps will serve as the MBRT Chair, except in cases where the bank is proposed solely for the purpose of complying with the Food Security Act (i.e., "Swampbuster" provisions), in which case the NRCS will serve as Chair. In accordance with State rules and statutes, either the DEP or a WMD will be the State permitting authority and will serve as the MBRT Co-Chair.

5. Logistics: Due to the overlapping geographic responsibilities of the involved agencies, the variety of ecosystems statewide, and the relatively high volume of mitigation banking activity in Florida, four regional MBRT Forums have been set up as follows:

Forum Name	Geographic Area	Meeting Frequency
St. Johns River MBRT	SJRWMD boundaries	Monthly
South Florida MBRT	SFWMD boundaries	Monthly
Southwest Florida MBRT	SWFWMD boundaries	Monthly
Panhandle - Big Bend MBRT	SRWMD and NFWMD boundaries	Bi Monthly

Hosting of the regional MBRT Forums will be on a rotational basis between the State and Federal Co-Chairs. Meeting dates will be scheduled in advance with the host agency responsible for distribution of the meeting agenda. *[Note: At the Federal level, each mitigation bank will have its own project-specific MBRT made up of the appropriate Federal agency representatives (See section IIC3 page 58610 of the Federal Guidance for more on agency roles and coordination). The project specific MBRTs should not be confused with the MBRT Forums since a given Forum will usually address more than one mitigation bank. Thus, the agency representatives at a given MBRT Forum could change depending on the agenda item. In most cases however, the same individuals will be members of multiple project-specific MBRTs.]* The regional MBRT Forums should be the primary vehicle for the evaluation of all phases of a mitigation bank (e.g., pre-application presentations, pending application discussions, post-permit issues). The agencies will strive to accomplish all important interactions with Bankers in the MBRT Forums in order to maximize interagency coordination.

6. Interagency Policy Coordination: The joint MBRT process is designed to evaluate the technical aspects of mitigation banking through a team approach. Experience to date has shown that during the technical evaluation of some mitigation banking proposals, policy issues were raised that needed close coordination of policy level decision makers of the respective agencies. Mitigation banks can often be related to public projects already planned or in place. These proposals usually need the input of agency specialists directly involved in the public project to determine if the proposed bank will be compatible. An interagency policy coordination procedure has been developed for the early identification of such proposals (See Appendix E). All mitigation bank proposals should be run through the policy coordination procedure. Projects that are identified as needing special attention should not be reviewed by the MBRT for technical sufficiency until the identified issues are resolved.

State/Federal Mitigation Bank Review Team Process

MBRT=Mitigation Bank Review Team
DMBI=Draft Mitigation Banking Instrument
MBI=Mitigation Banking Instrument

PACP=Pre-Application Coordination Phase
MSA=Mitigation Service Area
RAI=Request for Additional Information

FIRST CONTACT

- Banker's initial inquiry forwarded to MBRT Chair.
- Chair adds project to MBRT Forum tentative agenda.
- Chair sends banker info-package on State/Fed MBRT process and copies MBRT members.

Banker's submittal of prospectus begins the Pre-Application Coordination Phase (PACP). Banker sends prospectus to MBRT members at least 14 days prior to MBRT Forum.

MBRT FORUM

Banker may present project and receive informal MBRT feedback. Provided that a complete prospectus was submitted in advance, MBRT members should be prepared to take a position on:

- Bank site is/is not appropriate.
 - Long-term sustainability of the bank is/is not feasible.
 - Mitigation plan is/is not appropriate/feasible.
 - Banker's proposed method to assess eco-lift is/is not acceptable (actual scoring later in process).
 - Basis for Mitigation Service Area limits is/is not appropriate (may fine tune map later).
- (NOTE: A site visit may be needed before MBRT members are able to address these issues.)

Chair captures preliminary MBRT decisions in memo to all participants within 7 days.

Consensus
Bank Concept
is Inappropriate

No
Consensus

Consensus
Bank Concept
is Appropriate

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Within 30 days MBRT members indicate agency recommendation in comment letter. Non-consensus letters should specify issues and suggest remedies.

No
Consensus

Consensus
Bank Concept
is Inappropriate

At least 14 days prior to a future MBRT Forum, Banker may submit rebuttal or revisions to MBRT members.

Bank CONCEPT Approved

- PACP now complete.
- Banker begins preparation of DMBI
- Schedule site visit.

Banker may submit revised prospectus for reconsideration by MBRT if project can be modified to address issues.

Consensus Bank
Concept is Appropriate

Bank Concept is Appropriate.
Banker recognizes that
fully-executed BI for current
version of the proposal unlikely.

MBRT FORUM

- Banker may present rebuttal.
- MBRT attempts to reach consensus.
- Chair captures MBRT decisions in memo to all participants.

Consensus
Bank Concept
Inappropriate

No
Consensus

Bank CONCEPT Inappropriate

Chair notifies Banker and recommends remedies for consensus.

Bank Concept is Inappropriate

Dispute Resolution Procedure per federal guidance paragraph II.C.6.a.



MBRT SITE INSPECTION

- Using the agreed upon functional assessment method, MBRT scores ecological lift between the without-bank and with-bank scenarios.
- MBRT provides additional informal feedback to Banker to aid in preparation of the DMBI.

COMPLETENESS LOOP

**MBRT
input**

- State/Federal Co-Chairs Request Additional Information (RAI) within 30 days.
- All MBRT members will strive to coordinate completeness concerns with respective chairs.
- To the extent possible, State/Fed Co-Chairs will combine concerns for a joint RAI.

**Incom-
plete**

RAI

- 1) Banker submits DMBI to MBRT members.
- 2) Banker submits State/Federal construction permit applications to respective Chairs.

NOTE: differing legal requirements (e.g. time-frames, public notification) of the State and Federal processes may not allow for true joint processing. However, all MBRT members will continue to coordinate issues that surface in order to find compatible solutions.

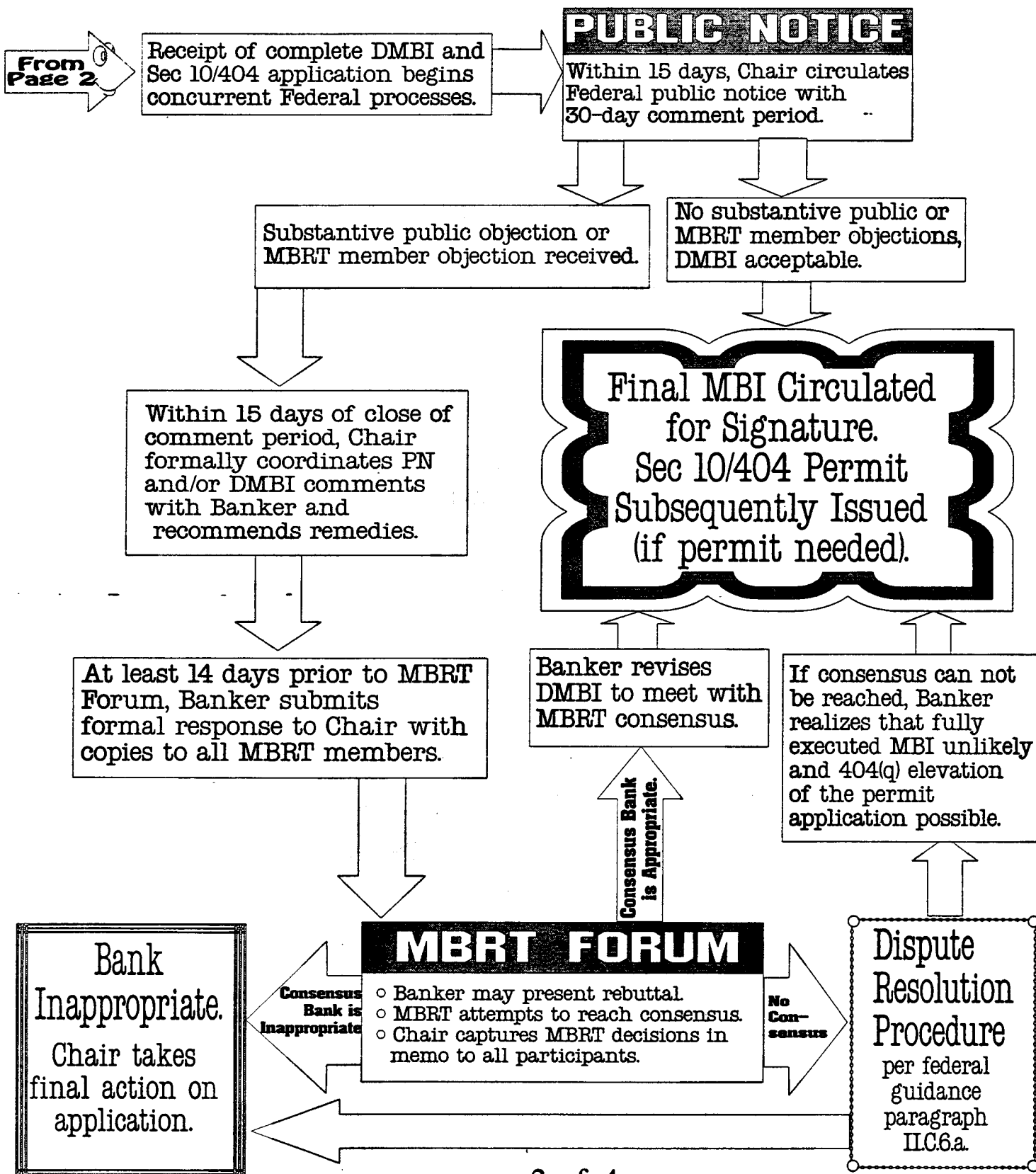
Receipt of complete DMBI and Sec 10/404 application begins concurrent Federal processes.

Receipt of complete application per WMD/DEP rules begins final State process.

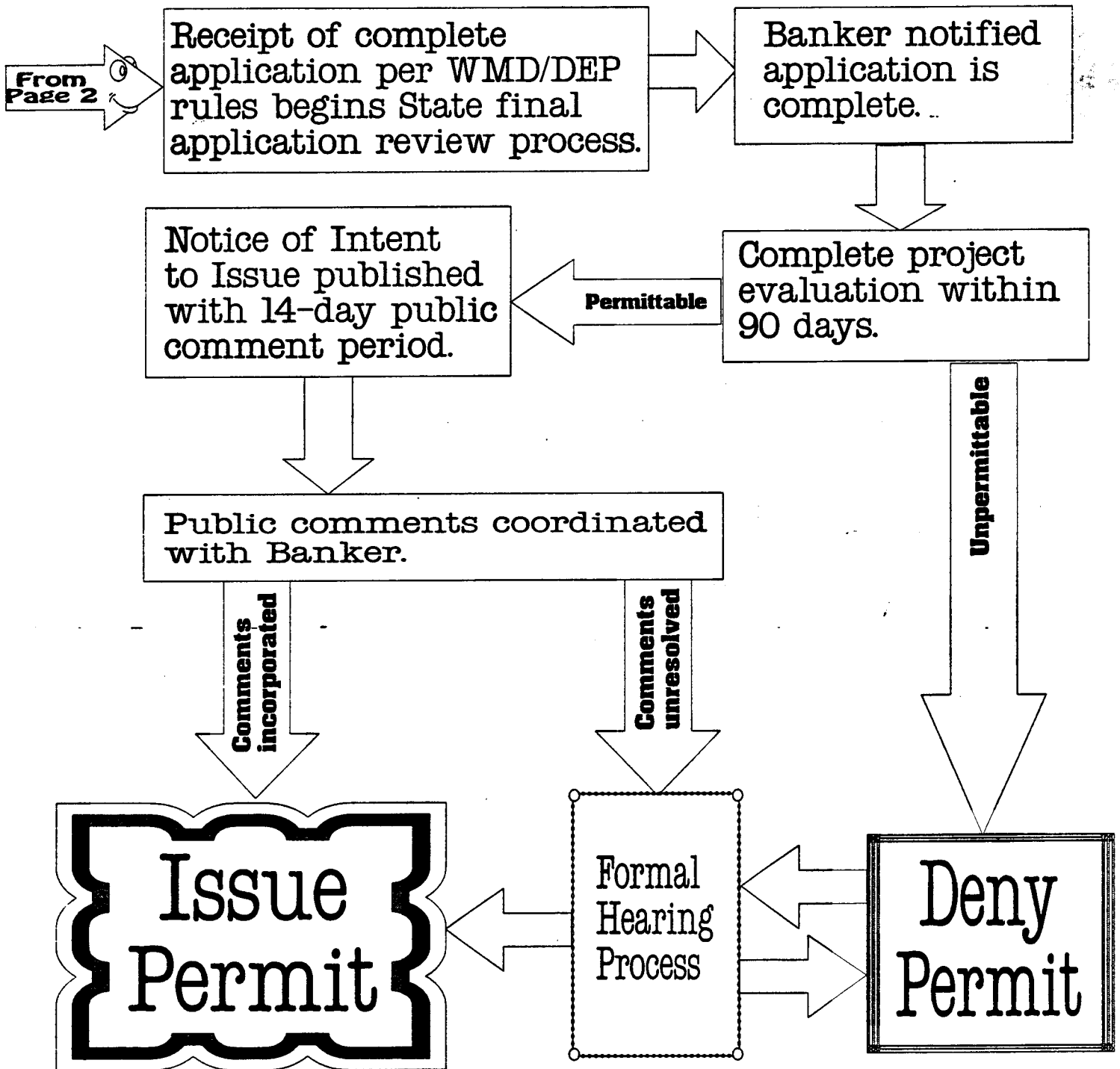
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4**

(Federal Processes)



(State Process)



SECTION 3 - Prospectus Guidelines

Prospectus Checklist

The Mitigation Bank Prospectus (Prospectus) is intended to be used at the pre-application coordination phase of the joint state/federal mitigation bank review team (MBRT) process to facilitate the exchange of information between prospective mitigation bankers and regulatory agency staff. The goal of the Prospectus is to maximize the effectiveness of the pre-application meeting for all attendees.

At a minimum, the following should be included in the prospectus. The more information that is provided, the more guidance can be provided by the MBRT.

1. _____ Aerial photography of the project site.
2. _____ Narrative overview of the project describing how the resulting increase in ecological value at the site will improve conditions in the regional watershed (or proposed mitigation service area).
3. _____ Types of mitigation proposed: Restoration, Enhancement, Creation and/or Preservation.
4. _____ Estimated acreages of each type of work: Restoration, Enhancement, Creation, and/or Preservation.
5. _____ Describe how the mitigation will be accomplished.
e.g. Hydrologic restoration via filling ditch network,
Re-establishment of fire regime,
Re-establishment of native vegetative communities via (name activity proposed),
Other.
6. _____ Existing vegetative community types and target native community types.
7. _____ A discussion of the current ecological conditions, the proposed ecological conditions under the with- and without-bank scenarios, and how the difference between these will be quantified. Relevant to this discussion are the presence of special biological resources and adjacent land uses.
8. _____ Address if the bank may affect or be affected by a public project. If so, discuss the bank's compatibility with the public project.
9. _____ A discussion of any existing or potential historic or archaeological resources on the site.

10. _____ A discussion of what interest in the property is currently held and will be maintained (e.g., fee simple ownership, lease or use agreement, etc.); identify any portion of the bank that would occur on public lands; identify the owner of that land.
11. _____ The proposed Mitigation Service Area.
12. _____ Identify the anticipated customers.
13. _____ Anticipated schedule for completion of the bank.
14. _____ Plans for perpetual maintenance and management of the bank, identifying the responsible party.
15. _____ A discussion of reasonable expected development for the site (if bank activities were not implemented) and the surrounding area.

SECTION 4 - Service Areas / In-Kind Vs. Out-of-Kind Determination

SERVICE AREAS FOR MITIGATION BANKS IN FLORIDA

The Florida statute and Federal Guidance regarding wetland mitigation banks specifically address the topic of service areas. Both documents indicate that the service area boundary should be defined according to hydrological and ecological functions. Additionally, both documents encourage flexibility as long as that flexibility is scientifically based. The Federal Guidance suggests a combination of using hydrologic cataloging units which have been mapped by the United States Geologic Survey (USGS) and "Ecoregions of the United States" by either James M. Omernik or Robert G. Bailey, as a guide. The Federal Guidance permits the option of using other classification systems developed at a state or regional level.

In Florida, watersheds have been mapped which define local/regional hydrologic units. Actual service area for banks will be clearly defined and mapped in mitigation banking instruments. The general acceptance of the service area will be reflected by the individual agency concurrence signature on the mitigation banking instrument. Refer to the following watershed maps which have been developed by the water management districts. These watersheds are subdivisions of the USGS hydrologic units. We have included two maps for northwest Florida reflecting different levels of refinement.

As the methods of defining service areas for mitigation banks in Florida are further refined, they will be considered by the Mitigation Bank Review Teams (MBRT) throughout the state and applied as appropriate. As suggested by statute and guidance, the MBRTs will be flexible in accepting the extent of the service area as long as it has a basis in natural science and is not based on economic considerations or political boundaries.

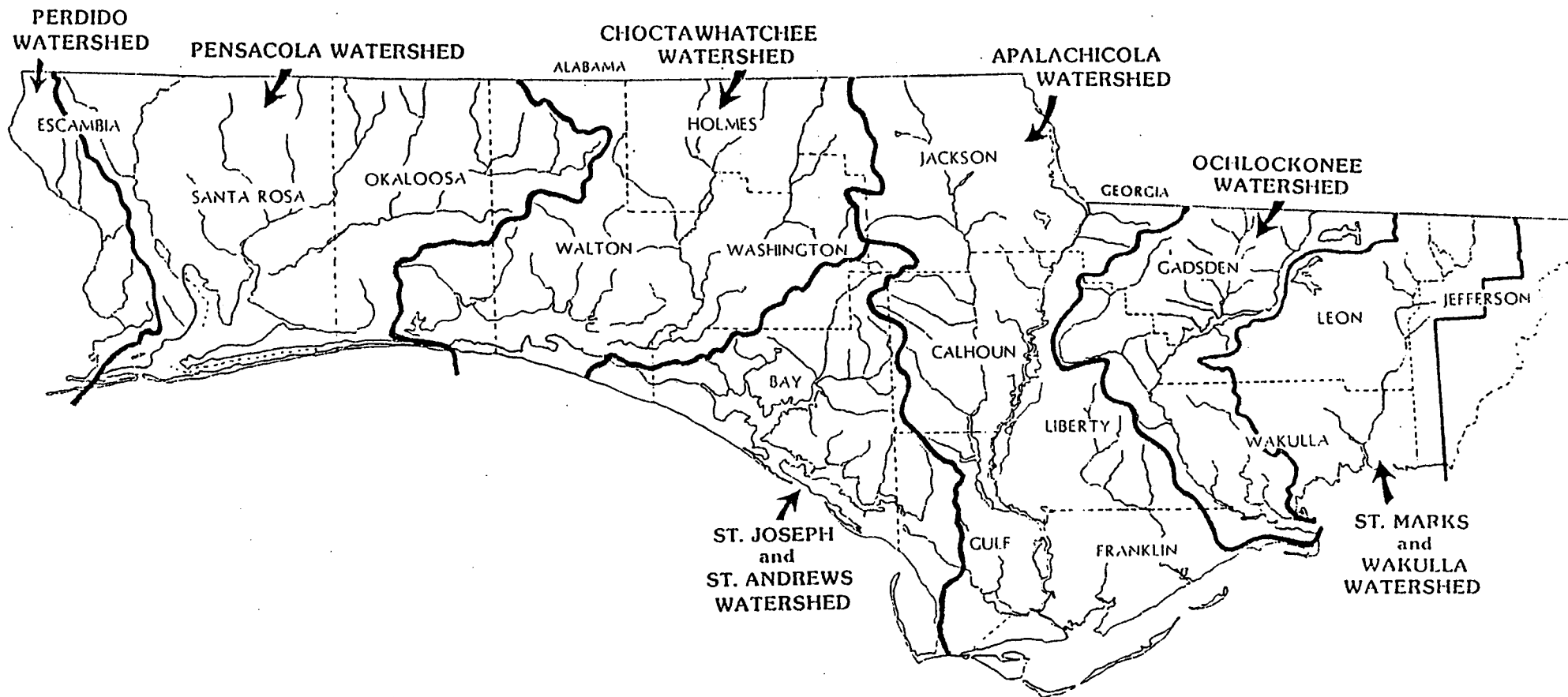
Use of a mitigation bank to compensate for impacts beyond the designated service area may be authorized on a case-by-case basis. The Federal agencies believe exceptional circumstances are required to go outside of the service area. Furthermore, the Florida MBRT discourages the use of a mitigation bank in mitigating for impacts outside of the service area. A "proximity" multiplier, derived through ecological considerations, should be used in the event of mitigating outside of the regional watershed boundaries. For example, in section 5d, the Florida MBRT has proposed a method of calculating a proximity factor, and will consider other methods of calculating such a factor. In addition, the use of a mitigation bank even within the designated service area may be limited by other state and Federal permitting criteria.

The mitigation service area (MSA) for a bank is based on the area within which adverse impacts could reasonably be expected to be offset by the mitigation bank. The MSA is generally coextensive with the regional watershed boundary, but may be larger or smaller than this boundary based on local ecological or hydrological considerations. For the State's review, the determination of whether or not a specific adverse impact can be offset by a specific mitigation bank can only be made on a case-by-case basis during the review of the application for the proposed impact. That determination includes a cumulative impact analysis, as required by Section 373.414(8) F.S., and as outlined in the respective rules of the FDEP and the water

management districts. In some cases, due to either the bank not being able to offset the adverse impacts or due to unacceptable adverse cumulative impacts within the watershed of the impact, the bank may not be able to be used, in full or in part, to mitigate for the proposed impacts.

IN-KIND VERSUS OUT-OF KIND MITIGATION DETERMINATIONS

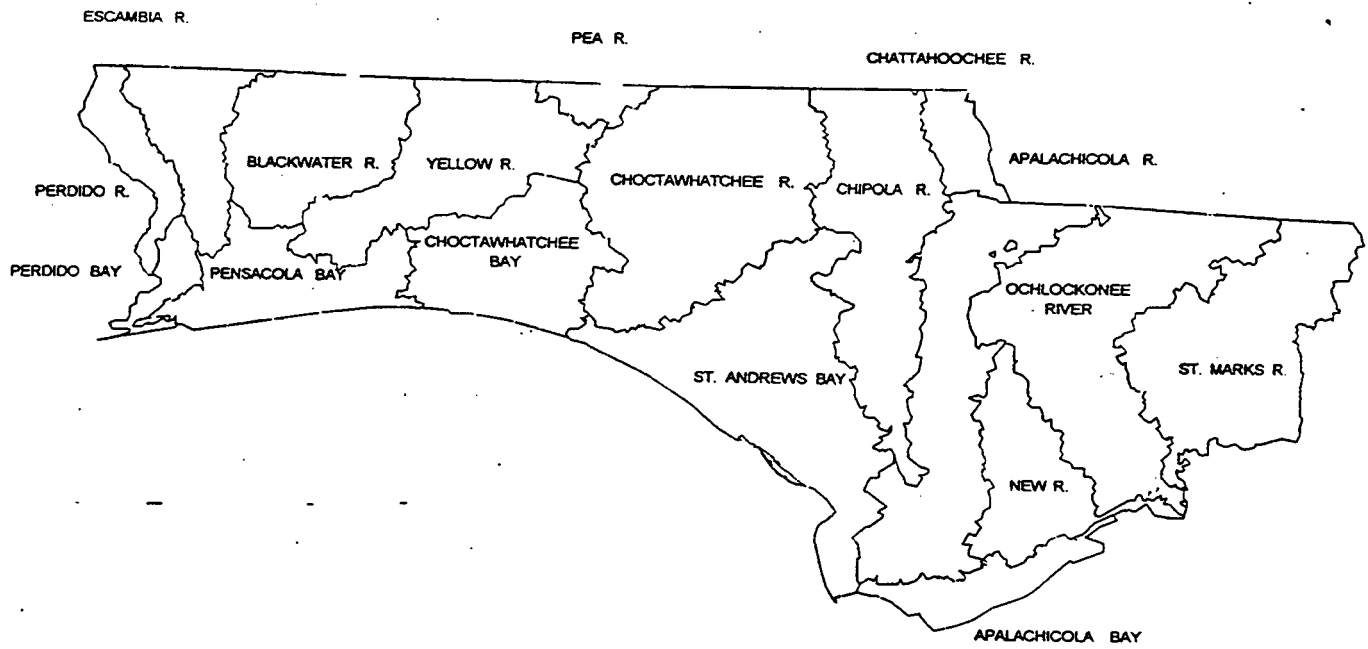
In the interest of achieving functional replacement and in agreement with state regulations on mitigation in general, in-kind compensation of aquatic resource impacts should generally be required. Out-of-kind compensation may be acceptable if it is determined to be environmentally preferable to in-kind compensation (e.g., of greater ecological value to a particular region). Out-of-kind compensation may be acceptable if it offsets functions provided by wetlands which are lost due to regulated activities. However, non-tidal wetlands should typically not be used to compensate for the loss or degradation of tidal wetlands. Decisions regarding out-of-kind mitigation are typically made on a case-by-case basis during the permit evaluation process. The mitigation banking instrument may identify circumstances in which it is environmentally desirable to allow out-of-kind compensation within the context of a particular mitigation bank (e.g., for banks restoring a complex of associated wetland types). Mitigation banks developed as part of an area-wide management plan to address a specific resource objective (e.g., restoration of a particularly vulnerable or valuable wetland habitat type) may be such an example.



**Regional Watersheds of the NFWMD
for Mitigation Banks**

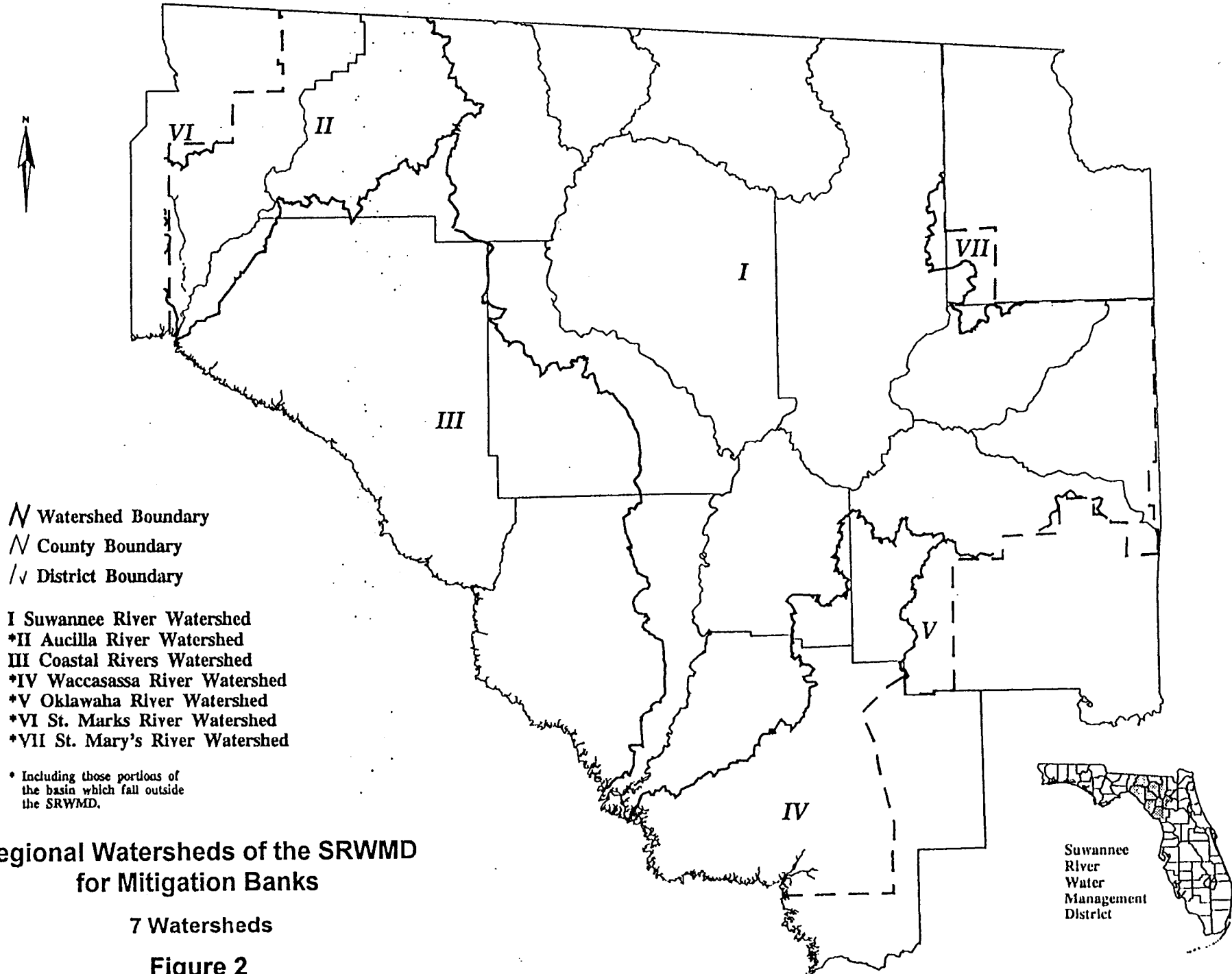
7 Watersheds

Figure 1



Hydrologic Unit Map of Northwest Florida

Source: FDEP, 1994

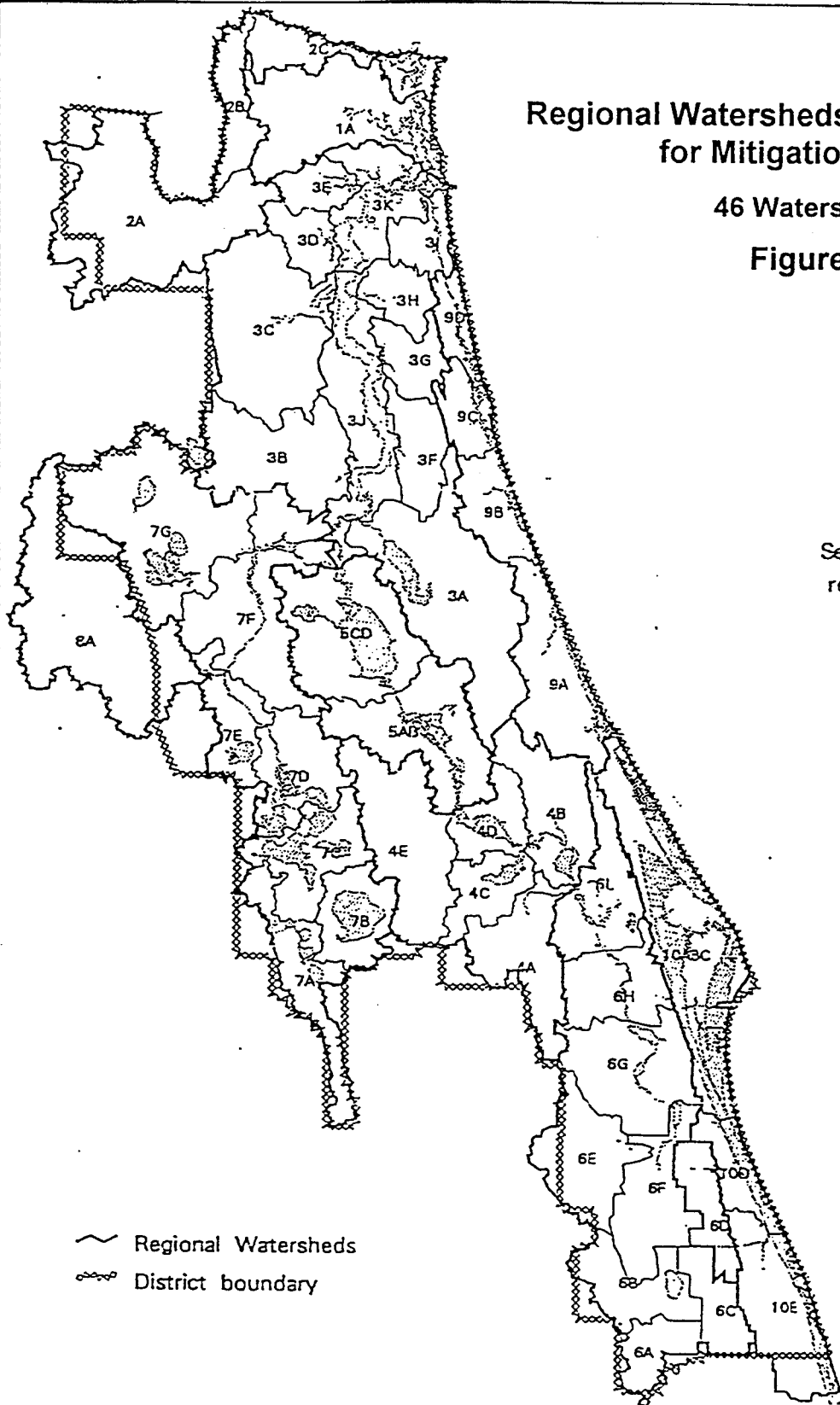


Regional Watersheds of the SJRWMD for Mitigation Banks

46 Watersheds

Figure 3

See attached table for
regional watershed names.



SJRWMD REGIONAL WATERSHEDS

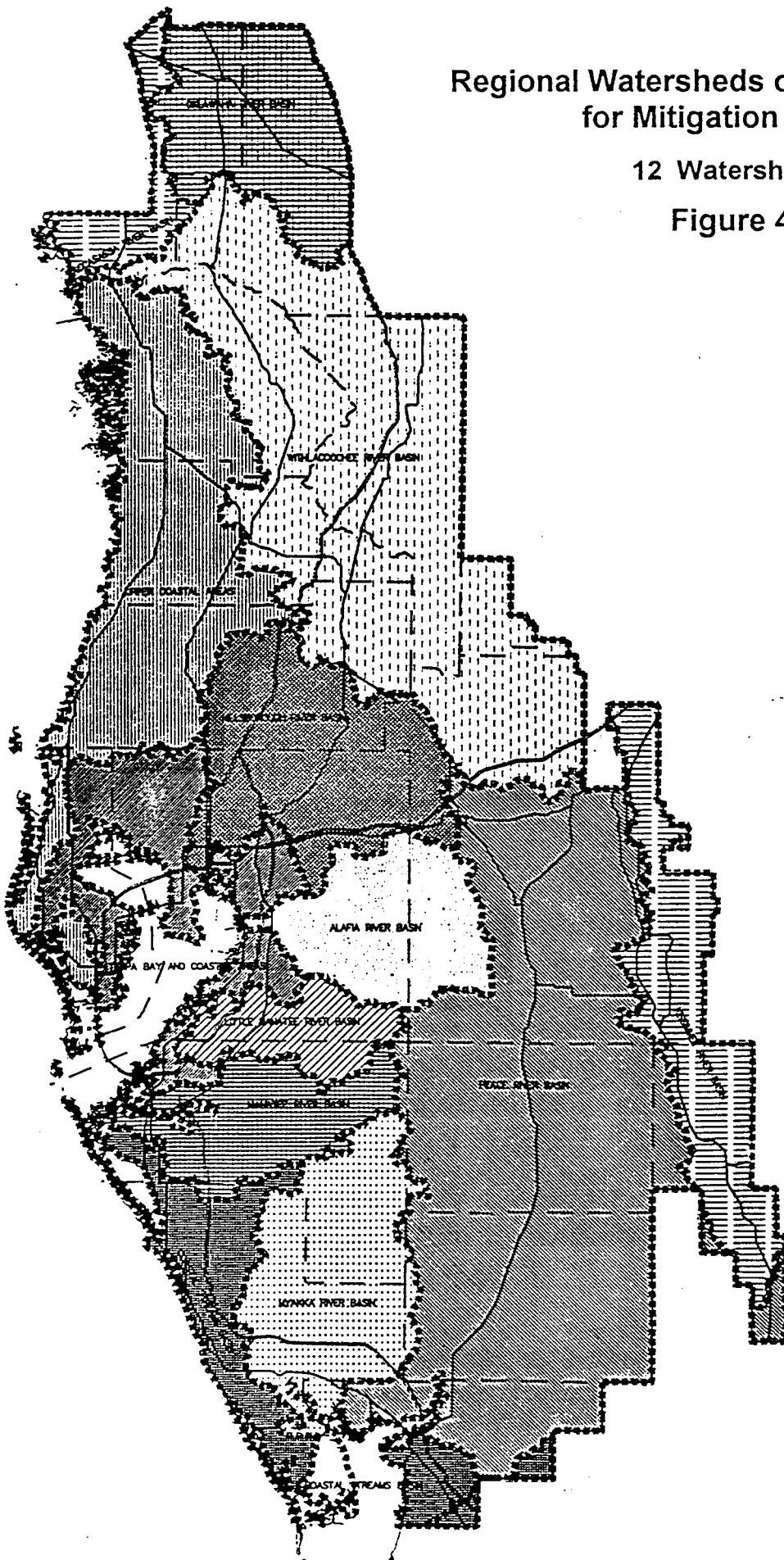
- 01 NASSAU RIVER
 - 1A Nassau River
- 02 ST. MARYS RIVER
 - 2A Upper St. Marys River
 - 2B Middle St. Marys River
 - 2C Lower St. Marys River
- 03 LOWER ST. JOHNS RIVER
 - 3A Crescent Lake
 - 3B Etonia Creek
 - 3C Black Creek
 - 3D Ortega River
 - 3E Trout River
 - 3F Deep Creek Unit
 - 3G Sixmile Creek
 - 3H Julington Creek
 - 3I Intracoastal Waterway
 - 3J South Lower Basin Unit
 - 3K North Lower Basin Unit
- 04 MIDDLE ST. JOHNS RIVER
 - 4A Econlockhatchee River
 - 4B Deep Creek Unit
 - 4C Lake Jessup
 - 4D Lake Monroe Unit
 - 4E Wekiva River
- 05 LAKE GEORGE
 - 5AB Lake Woodruff Unit, Alexander Springs Creek
 - 5CD Lake George Unit, Lake Kerr Unit
- 06 UPPER ST. JOHNS RIVER
 - 6A Fort Drum Creek Unit
 - 6B Blue Cypress Creek Unit
 - 6C Fellsmere
 - 6D Interbasin Diversion
 - 6E Jane Green Creek
 - 6F St. Johns Marsh
 - 6G Lake Poinsett Unit
 - 6H Tosohatchee Unit
 - 6I Puzzle Lake Unit
- 07 OCKLAWAHA RIVER
 - 7A Palatlakaha River
 - 7B Lake Apopka
 - 7C Lake Harris Unit
 - 7D Lake Griffin Unit
 - 7E Marshall Swamp Unit
 - 7F Lake Ocklawaha Unit
 - 7G Orange Creek

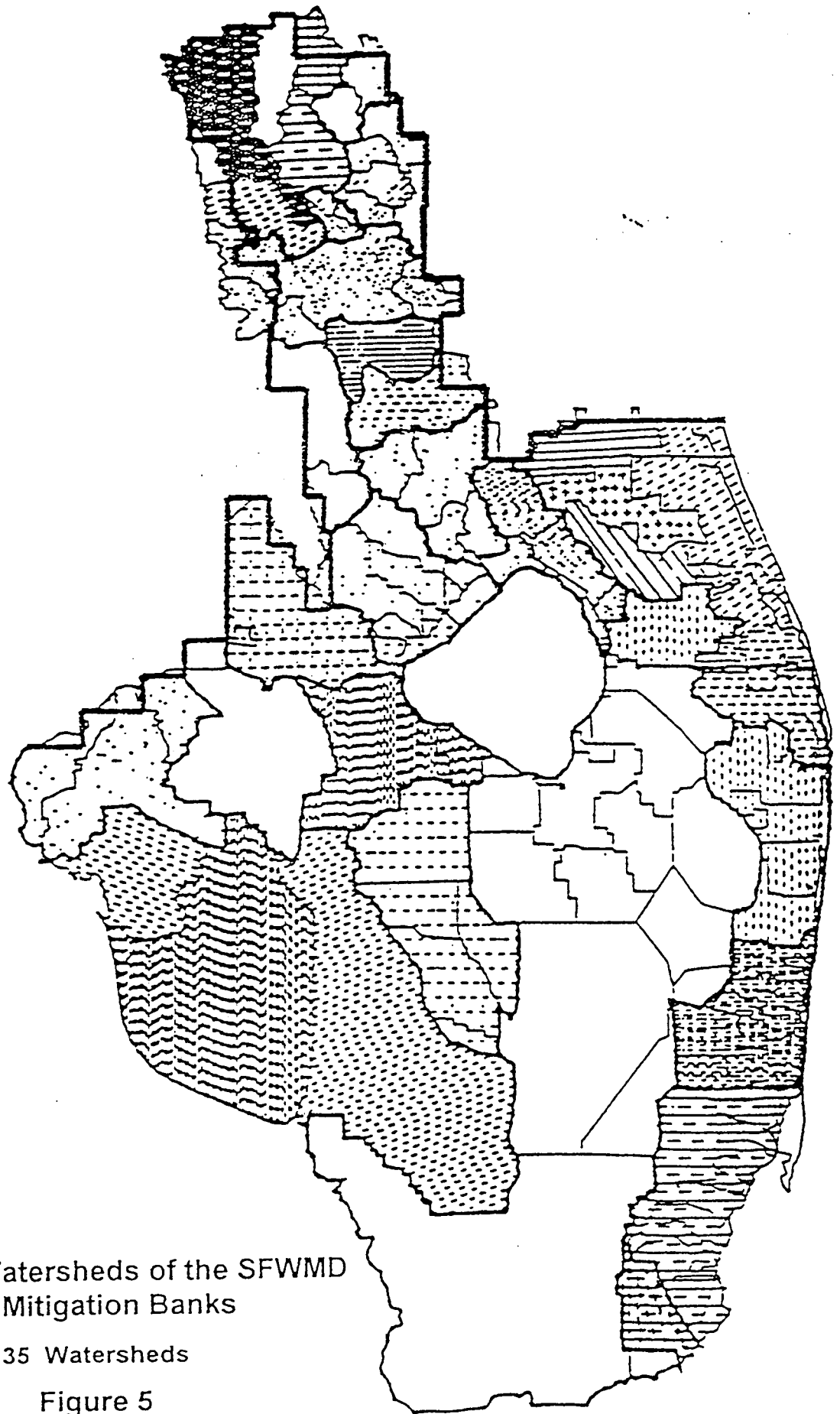
- 08 FLORIDA RIDGE
 - 8A Florida Ridge Unit
- 09 UPPER COASTAL
 - 9A Halifax River
 - 9B Pellicer Creek Unit
 - 9C Matanzas River
 - 9D Tolomato River
- 10 INDIAN RIVER LAGOON
 - 10ABC Mosquito Lagoon, Banana River, North Indian River Lagoon
 - 10D North Central Indian River Lagoon
 - 10E South Central Indian River Lagoon

Regional Watersheds of the SWFWMD for Mitigation Banks

12 Watersheds

Figure 4





Regional Watersheds of the SFWMD
for Mitigation Banks

35 Watersheds

Figure 5

SECTION 5 - Calculating Credits And Debits

DETERMINING CREDITS and DEBITS

The objective of a mitigation bank is to replace or offset the chemical, physical and biological functions of wetlands and other aquatic resources which are lost as a result of authorized impacts. Using appropriate methods, the newly-established functions are quantified as mitigation credits. For Federal purposes, the same method used to quantify credits should also be used at the impact sites to determine debits. In accordance with their respective rules, the method(s) through which the participating State agencies determine credits and debits may differ from what is proposed herein. Please consult with your local DEP or WMD office.

Preface - The advent of mitigation banking is bringing change to the traditional ways regulators evaluate compensatory mitigation for permitted wetland impacts. For banking to work, a predictable trading system must be established based upon a standardized currency. The purpose of this section is to present the MBRT's proposal for a mitigation trading system. This system is designed to work for project-specific mitigation as well as for banking. Traditionally, the following factors were usually considered by the evaluator to determine the appropriate level of compensatory mitigation needed to offset a permitted impact:

- 1) the functional level (i.e., the quality) of the wetlands to be affected by the impact project,
- 2) the functional level that the created, restored, enhanced, or preserved wetlands are expected to attain through the mitigation project,
- 3) the uncertainty that the predicted functional level of the mitigation project will in fact be attained and maintained in the long term,
- 4) the timing of the mitigation project relative to the impact project,
- 5) the proximity of the mitigation project relative to the impact project (i.e., on-site versus off-site or in-watershed versus out-of-watershed),
- 6) the respective wetland types involved (i.e., in-kind or out-of-kind compensation),
- 7) the landscape context of the mitigation and impact sites, and
- 8) the "importance" or "value" to society of the wetland functions being evaluated.

This analysis traditionally resulted in an acreage-based compensation ratio (e.g., create 3 acres of new wetlands for every natural acre destroyed). Please note that except for items 2, 3, 7 and 8, some specific information about the impact site is required to develop a compensation ratio. When determining the appropriate number of credits to be awarded to a mitigation bank, however, specific information about the impact sites is not known. One way to handle this situation is to evaluate the actual functional levels that have been attained at the bank at the time of debiting for each and every impact. Clearly, this would not be an efficient approach to the administration of the banking system. The alternative is to relate conditions at the bank and impact sites back to an independent datum. As long as the impact and mitigation sites are evaluated through the same method, and that method is calibrated to a datum common to both sites, the independent evaluation of the impact and mitigation sites can be done. The following credit and debit evaluation method employs this premise and attempts to capture all of the elements 1-8 listed above.

Credit and Debit Units – In the context of the Federal wetlands regulatory program, the purpose of requiring compensatory mitigation for permitted impacts is to achieve “no net loss” of wetland **function**. This does not mean that the total spatial extent of the wetlands in a given watershed is unimportant. Rather, this goal reflects the reality that wetlands protection legislation was enacted to protect the functions wetlands perform which are important to society. Regulatory decisions are therefore based on a blend of scientific analysis of wetland functions and judgement regarding the relative importance of the functions being analyzed. To keep these concepts separate, the terms “capacity” and “importance” are used herein. Credits and debits are the terms used to designate the units of trade in mitigation banking. The number of credits assigned to a bank should reflect the improvement in wetland functional level expected to result from establishment of the bank and also recognize the importance of these improvements. Similarly, the number of debits needed to compensate for permitted impacts should reflect the decrease in wetland functional level expected to result from the project and also recognize the importance of the losses. A credit/debit unit is therefore defined, as the ecological value associated with one acre of wetland that is functioning at the highest possible capacity that is attainable within the service area of the bank. As you will see, these units will be weighted according to societal importance and other intangibles. The units will also be corrected for temporal losses.

Measuring Changes in Wetland Function Level - Changes in functional levels between site conditions under the with-bank and without-bank scenarios should be measured by an appropriate wetland functional assessment method to determine the number of bank credits. Conversely, to determine the number of debits needed to meet the mitigation requirement for a permitted activity, the same functional assessment method should be used to measure the change in levels between the existing conditions and the predicted post-project conditions at the impact site. The ecological conditions of each of these scenarios, both at the bank and impact sites, are compared against a datum that is applicable within the bank’s service area. The datum should be developed to represent the highest possible functional capacities that wetlands within the service area can attain. The reference domain concept, as developed in the Hydrogeomorphic (HGM) approach, represents the range of wetland functioning levels of a specific type of wetland within a specific region. The reference domain is applicable to many other wetland functional assessment techniques. For example, in the Wetland Rapid Assessment Procedure (WRAP) developed by the SFWMD, the calibration descriptors for the highest possible numerical score for a given function describe the highest functional capacity which that particular function can attain within the region WRAP is written for. In other words, the calibration descriptors for the “best” scores in WRAP can be construed as describing the “attainable conditions” in an HGM reference domain. Comparing the gains in functional levels at the bank and the losses in functional levels at impact sites against a common datum allows for “standardization” of the credits and debits for a given bank. The standardized measurement of differences in functional levels produce outputs that represent the percentage increase and decrease in wetland function at the bank and impact sites, respectively. The percentage increase or decrease in a functional level is herein referred to as “the delta” or symbolically as Δ . To illustrate the concept of the level of a wetland function, a brief example is presented. In the HGM approach, a Functional Capacity

Unit (FCU) is defined by multiplying the Functional Capacity Index (FCI) for the function in question by the acreage of the wetland area being assessed. It should be noted that each wetland function addressed in a given HGM model has its own FCI. For example, in the model for Peninsular Florida Depressional Wetlands (currently under development) the following FCIs are generated:

- FCI_{HYDRO} - Maintenance of Characteristic Hydrologic Regime
- FCI_{BCNC} - Biogeochemical Processes
- FCI_{REMOVAL} - Abiotic Retention and Removal of Nutrients and Compounds
- FCI_{PART} - Particulate Retention
- FCI_{PLANT} - Maintenance of Characteristic Plant Community
- FCI_{WILDLIFE} - Maintenance of Distribution and Abundance of Vertebrates and Invertebrates.

In mitigation banking, the HGM delta would be the difference in FCIs under the with- and without-bank scenarios. Please refer to the following table for an example. Note: The listed FCIs are for only one of the assessment areas at a theoretical bank and do not represent an actual situation.

	Column A	Column B	Column C	Column D	(CxD)
FCI	With-Bank Scenario	Without-Bank Scenario	(B-A) FCI Delta	Assessment Area	Assessment Area FCU
Hydro	0.8	0.5	0.3	100 acres	30 FCU _{HYDRO}
BCNC	1.0	1.0	0.0	100 acres	0 FCU _{BCNC}
Removal	0.9	0.7	0.2	100 acres	20 FCU _{REMOVAL}
Part	1.0	0.6	0.4	100 acres	40 FCU _{PART}
Plant	0.7	0.2	0.5	100 acres	50 FCU _{PLANT}
Wildlife	0.6	0.3	0.3	100 acres	30 FCU _{WILDLIFE}

To accurately account for the relative gains and losses of the various capacities within a watershed, the mitigation banking currency units could be the FCUs themselves. In other words, a bank's "inventory" would have a certain number of FCU_{HYDRO}, FCU_{BCNC}, FCU_{REMOVAL} and so on. The appropriate level of compensatory mitigation needed to offset a permitted impact could be determined in the same way. This approach to mitigation accounting precludes the need to "weight" the importance of the various functions against one another in order to produce a single unit of trade. Although this approach may be more accurate from a purely scientific standpoint, it would make the accounting more complicated and ignores the fact the regulatory decisions include societal considerations regarding the importance of the functions. Regardless of the assessment procedure used to evaluate changes in capacity, the way in which the suite of functional outputs is handled is significant and must be carefully considered. The MBRT presently prefers the use of WRAP, see Section 5a.

Weighting Wetland Functions – There are several ways to derive a single unit of trade from the suite of wetland function capacities produced by a given assessment model. The following approaches illustrate how the FCI outputs from the HGM example could be used. One simple way to produce a single HGM delta for a given assessment area would be to take the largest FCI delta from the suite of FCIs and multiply it by the acreage of the assessment area. Using the data in the example table, the 0.5 delta for FCI_{PLANT} would be multiplied by 100 acres to produce 50 credits for that assessment area. Another simple approach would be to weight the individual FCI deltas equally by taking the average and multiplying the result by the acreage of the assessment area. This would produce 28.3 credits for the 100-acre assessment area. Another approach would be selection of an “umbrella function.” For example, if it was determined that FCI_{WILDLIFE} is the function most sensitive to change in a given HGM model, it could be designated the umbrella function. In the above example, the delta of 0.3 for FCI_{WILDLIFE} would be multiplied by 100 acres producing 30 credits. The difference between 28.3 credits and 50 credits is substantial. Obviously, careful value judgments must be made regarding the relative importance of each function in order to produce a single output. The emergence of mitigation banking and its demand for a specific accounting system sharply focuses the need for watershed /ecosystem planning. Such plans should establish the relative societal importance of the individual wetland functions to aid the decision-making process. In order to move mitigation accounting forward in the meantime, the MBRT proposes a simple method to assign relative importance weights to the wetland functions under evaluation. The method is described in Section 5b, Wetland Function Weighting.

Affected Areas - This section discusses the way acres are introduced into the credit/debit calculations. Deltas are applied to the individual wetland areas that will be affected by mitigative actions at the bank, or will be adversely affected by development activities at the impact site. These individual assessment areas are measured in acres and are herein referred to as “polygons”. In most cases, the polygon boundaries will coincide with the wetland boundaries, but there can be exceptions (e.g., a non-wetland in the without-bank scenario that will become a wetland in the with-bank scenario should be delineated as a polygon). The complexity of polygon delineation will largely depend upon the complexity of the landscape at the bank or impact site, and the various scenarios that are under comparison. There are no strict rules in delineating polygons other than the fact that upland areas under the with-bank scenario can not be included. This rule is necessary to maintain balance in the overall equation because upland areas cannot be included in the delineation of polygons at the impact sites.

Ecosystem Considerations

- **Preservation** - Consideration of the without-bank scenario when measuring changes in wetland function allows for quantification of the preservation value of the bank when compared with existing conditions. The determination of an appropriate without-bank scenario should be based on a demonstrable threat of wetland function degradation due to human activities that might not otherwise be expected to be restricted. The existence of a demonstrable threat will be based on clear evidence of ecologically destructive land use

changes which are consistent with local and regional land use trends and are not the consequence of actions under the control of the bank sponsor.

- **Uplands** - It is widely recognized that intact uplands can augment the functional capacities of adjacent wetlands. This augmentation is captured in the scoring of the deltas for the individual wetland polygons at a bank. Conversely, upland development at the impact site can produce secondary impacts to adjacent wetlands. These losses in capacity are similarly considered in the scoring of deltas for the wetland polygons at the impact site.
- **The Bigger Picture** - Some ecological considerations may not be captured in the functional assessment method used to assess the deltas for individual polygons at the bank or impact sites. These large-scale considerations are usually related to the site's location within the overall landscape, or its "ecosystem context" if you will. Location of the bank or impact site relative to other ecological features, hydrologic sources, and compatibility with adjacent land uses and watershed management goals are important factors for consideration. These large-scale considerations are usually related to the capacity of a given wetland function but they are best captured in the weighting of the appropriate wetland function as described in Section 5b.

Mitigation Timing and Risk - In mitigation banking, the relative timing between the implementation of mitigation and the occurrences of the permitted wetland losses is controlled, for the most part, through the credit release schedule. In other words, credits are incrementally released to the bank as the mitigation work proceeds and as the completed work is determined to be successful through required monitoring protocols. *(Note: In this context, success does not necessarily mean the created, restored or enhanced wetland has achieved all of the functional capacities that were predicted under the with-bank scenario. Rather, success simply means the success criteria specified in the MBI have been met. Depending upon the mitigation activity, these two concepts of success could vary greatly).* Credit release schedules are usually on the order of five to ten years. For many mitigation activities, such as hydrologic restoration, the functional capacity predicted under the with-bank scenario can be verified within the relatively short time frame of a credit release schedule. For other mitigation activities, such as creation of a forested wetland, the maturation period needed to reach the functional capacities predicted under the with-bank scenario can be much longer than the credit release schedule. This delay in the replacement of the lost functional capacity is called "temporal lag". In addition to the temporal lag associated with some mitigation activities, there is uncertainty that mitigation activities will actually succeed in meeting the predicted functional capacities. The traditional way of handling temporal lag and the risk associated with uncertainty was to consider them in the determination of an acreage-based compensation ratio. This requires specific knowledge of the relative timing of the mitigation and impact activities. This is not possible in banking because the total number of potential bank credits must be determined when the bank is established. Rather than applying a ratio to bank credits at the time they are debited, it is simpler to "adjust" potential bank credits for temporal lag and risk at the time they are assigned. Therefore, a "temporal lag" factor (T) is introduced into the credit side of the equation whenever the maturation period of the proposed

mitigative activity is longer than the credit release schedule. A method to determine the T-factor is discussed in detail in Section 5c, with a brief discussion of a risk factor.

In-Kind versus Out-Of-Kind Compensation - The proposed credit/debit formula does not address this issue because it is very difficult, if not impossible, to relate widely differing wetland types back to a common datum. The traditional general rule of thumb still applies. In-kind compensation is preferable and out-of-kind compensation must be considered as a special case.

FORMULA

Based on the above concepts, the following formula has been developed to assign credits to mitigation banks and determine debits needed to meet the compensation requirement for permitted impacts. For each polygon at the bank or impact site, each function in the wetland functional assessment model is evaluated. This produces a Δ for each of the functions when comparing with and without bank scenarios. The Δ for each function is then multiplied by the W- and T-factors. For each polygon you now have a weighted Δ that has been corrected for temporal lag. Each Δ is now multiplied by the acreage of its polygon. The products are then summed to produce the final credit or debit total. Please note that for debit calculations, the T-factor is set to 1.0 because the temporal lag in function has been accounted for in the credit calculation. Step-by-step examples employing this formula are presented in Sections 5f and 5g.

$$\sum_{P=1}^{P=n} \left[\sum_{function=1}^{function=n} (\Delta * W * T) A \right] Px$$

Terms are defined as:

Σ stands for **Summation**. The operations shown to the right of a Σ symbol are performed on the indicated variables starting with the variable number below the symbol and finishing with the variable number above the symbol. The results for each of these operations are then added up (or summed) to produce the total.

Δ stands for **Delta**. The delta represents the change in the capacity of an individual wetland function for a given polygon within the bank or impact site.

P stands for **Polygon**. Polygons (1-n) at the bank site are delineated based on the areas that will be affected by the mitigative actions. For development projects proposing to debit the bank, polygons are delineated based on the wetland areas that will be impacted (both directly and secondarily) by the project.

W stands for the **Weighting Factor (or W-factor)**. The W-factor takes into consideration large-scale ecological consideration not captured in the Δ . This factor includes important societal considerations such as watershed/ecosystem management issues, threatened and endangered species, rare or scarce habitats, adjacent and on-site special land use designations.

T stands for the **Temporal Lag Factor (or T-factor)**. The T-factor is a correction factor used to account for temporal losses in wetland function.

Px stands for **Proximity Factor**. This multiplier is used only on the impact site; only if the site is not located in the bank's watershed.

A stands for **Area of Polygon**. A polygon is an assessment area measured in acres.

SECTION 5a - Wetland Rapid Assessment Procedure

While the Florida MBRT adopted South Florida Water Management District's WRAP as the preferred functional assessment methodology to use in banking at this time, the team has added several items to accommodate the banking process. They are as follows:

Under the Wildlife Variable, the team has defined in more detail a suite of guilds to be included in the descriptors. See addendum following the WRAP document.

Under the Water Quality Variable, the team outlined water quality parameters and sampling procedures necessary to better evaluate success. See addendum following the WRAP document.

Due to the weighting procedures adopted by the Florida MBRT, WRAP section 2.2, Methodology for Scoring Habitat Variables, will not be followed in entirety. The scores may not be summed or divided by the total maximum score as stated at the end of the methodology; rather, an alternative procedure is explained in sections 5b and 5f.

If the bank is located in an estuarine environment, WRAP should not be used. The Development Team modified WRAP to accommodate the estuarine system (EWRAP). A copy of EWRAP may be obtained from the U.S. Army Corps of Engineers, Regulatory Division, South Permits Branch, in West Palm Beach, 561-683-1632.

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**WETLAND RAPID ASSESSMENT PROCEDURE
(WRAP)**

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SOUTH FLORIDA WATER MANAGEMENT DISTRICT**

ABSTRACT

The Wetland Rapid Assessment Procedure (WRAP) is a matrix developed by the South Florida Water Management District to assist the regulatory evaluation of mitigation sites (created, restored, enhanced or preserved) that are permitted through the District's Management and Storage of Surface Waters or Environmental Resource Permit processes. The objectives of WRAP are: 1. to establish an accurate, consistent, and timely regulatory tool; 2. to track trends over time (land use vs. wetland impacts); and 3. to offer guidance for environmental site plan development. WRAP evaluation is a rapid assessment meant to be used within the limited timeframes of the regulatory process. Test results of the WRAP procedure showed it to be highly repeatable and an effective training tool for biologists. As additional data are collected, further analysis will be conducted in an attempt to establish a relationship between land use and wetland function.

Key Words. wetland assessment, mitigation, wetland function, anthropogenic impacts, wetland evaluation, land use impacts, habitat assessment.

EXECUTIVE SUMMARY

Wetland Rapid Assessment Procedure (WRAP) is a matrix developed to assist in the regulatory evaluation of wetland sites that have been created, enhanced, preserved, or restored through the District's Management and Storage of Surface Waters or Environmental Resource Permit processes. This standardized matrix can be used in combination with professional judgment to provide an accurate and consistent evaluation of wetland sites.

The WRAP matrix establishes a numerical ranking for individual ecological and anthropogenic factors (variables) that can strongly influence the success of mitigation projects. The numerical output for the variables is then used to evaluate the current wetland condition. The matrix can be used to evaluate a wide range of wetland/upland systems (e.g., emergent marsh, wet prairie, hardwood swamp, wet pine flatwoods, etc.) but it is not intended to compare different wetland community types (i.e., marsh to wet prairie) to each other.

Use of the WRAP matrix is intended to accomplish a number of objectives: to establish a simple, accurate, consistent and timely regulatory tool; to track trends over time (land use vs. wetland impacts); and to offer guidance for environmental site plan development.

WRAP is not a substitution for applied research science. It is a tool that is to be used by the regulatory community to ensure consistency and accuracy when evaluating a site during the regulatory process of resource permitting and post permit compliance. WRAP can be used as a tool to document baseline information for a site prior to development activities. WRAP input data consist primarily of field observations and professional experience.

WRAP variables include the following:

- Wildlife Utilization
- Wetland Overstory/Shrub Canopy
- Wetland Vegetative Ground Cover
- Adjacent Upland Support/Wetland Buffer
- Field Indicators of Wetland Hydrology
- Water Quality Input and Treatment Systems

Evaluation of a wetland site requires office preparation as well as the field investigation. Office preparation includes obtaining aerial maps, identifying the project boundaries and adjacent lands uses, and identifying on-site wetland areas. In addition, the evaluator should attempt to locate any references to on-site hydrology, soils, site management, seasonal variability, wildlife studies, rainfall data and any other pertinent information.

Methodology for the Habitat Assessment Variable is a series of discussions - one for each WRAP assessment variable. Following each variable description is a matrix containing a set of calibration descriptions and corresponding score points. A score of 3 is considered the best a system can function and 0 is for a system that is severely impacted and is exhibiting negligible attributes.

Each system must be evaluated on its own attributes and is not to be compared to a different type of system (i.e. wet prairie vs. marsh vs. cypress dome). An evaluator also has the option to score each parameter in half (0.5) increments. This provides the flexibility to score a variable that is not accurately described or fitted by the calibration description. Half increments are utilized on the point scale from 0.5 through 2.5. Each applicable variable is scored; the scores are totaled (ΣV) and then ΣV is divided by the total of the maximum score for that variable (ΣV_{\max}). The final rating score for "Habitat Assessment Variables" will be expressed as a number between 0 and 1.

WRAP has been tested statistically and found to be a repeatable procedure. A total of 303 data points was used in the preliminary testing of WRAP. This included 81 different wetland sites with between 3-5 independent evaluators per site, 8 different wetland communities and 19 land use designations. Analysis for multicollinearity and correlations among the variables yielded no significant correlation.

Ten land use designations were originally selected in the attempt to determine the degree of impact associated with the wetland variables identified in WRAP. The ten land use designations were as follows:

- Agriculture
- High Intensity Commercial
- Highways
- Industrial
- Institutional
- Low Density Residential
- Low Intensity Commercial
- Multi-Family Residential
- Recreational/open space
- Single-Family Residential

Once the testing of WRAP was complete it became apparent that for most land uses the dataset was inadequate to make any inferences with regard to land use associated with wetland impacts. In addition, the testing of WRAP identified as many as eight additional land uses that were not originally included. The current list of WRAP land use designations now includes:

- Citrus Grove
- Dairy and Feedlot
- Golf Course
- High Intensity Commercial
- Highways
- Improved Pasture
- Industrial
- Institutional
- Low Density Residential
- Low Intensity Commercial
- Mining
- Moderately Intensive Commercial
- Multi-Family Residential

- Open space / Natural Undeveloped Areas
- Recreational
- Row Crop
- Single-Family Residential
- Unimproved pasture / Rangeland
- Sugarcane

As additional data are collected, further analysis will be conducted in an attempt to establish a relationship between land use and wetland function.

The overall objective in the development of WRAP is to utilize as much information as possible, both from literature reviews and professional experience, and organize it in the form of a simple but accurate matrix. In order for a functional assessment procedure to be accepted by the regulatory community, the procedure has to be simple enough to use without collecting time-consuming field data and must be able to be completed within a relatively short time period.

1. The first part of the paper is a review of the literature on the effects of the 1997 Asian financial crisis on the economies of the Asian countries. It discusses the impact of the crisis on the real economy, the financial system, and the labor market.

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GLOSSARY

Agriculture – the science or art of cultivating the soil, producing crops, or raising livestock..

Anthropogenic activities – relating to, or resulting from the influence of human beings on nature.

Appropriate plant species - plant species which are appropriate for a given community type (i.e., *Rhynchospora tracyi* in a wet prairie, *Nymphaea odorata* in a deepwater marsh).

Canopy - the plant stratum composed of all woody plants and palms with a trunk four inches or greater in diameter at breast height (4.5'), except vines.

Decreased hydroperiod - a decrease in the annual period of inundation, resulting in a change in the plant community composition and structure. The effect is usually an increase of transitional and upland plant species.

Desirable plant species - native plant species that are appropriate for a specific community type and provide benefits to wildlife in the forms of food, cover, and nesting potential.

Direct impacts - physical acts such as dredging or filling of wetlands.

Design protocol – the design of a scientific experiment or treatment.

Dry detention areas - created impoundments with a bottom elevation of at least one foot above control elevation of the area.

Duration of inundation – period of time inundation occurs on an annual basis.

Exotic plant species - plant species that are non-native, purposefully or accidentally introduced by humans to a geographic area. Many are invasive in nature and disrupt native plant communities.

Freshly mulched created mitigation area - the spreading of hydric soils (with viable native seed bank present) across a graded, newly constructed mitigation area.

Grass swales - a linear depression, usually designed to capture, store, and convey stormwater runoff.

Ground cover - the plant stratum composed of all plants not found in the canopy or subcanopy.

Heavily impacted – impacted by human activities to such a degree as to reduce significantly the functionality of a system.

High intensity commercial - land uses consisting of commercial with high levels of traffic volume. Traffic is constantly moving in and out of the area; including downtown areas, commercial office sites and regional malls.

High intensity land use - intensive agricultural operations such as dairy farming (including feedlots), and high intensity commercial projects. These land uses are significantly disruptive to wetland systems through direct and indirect impacts.

Highways - major road systems such as interstate highways, major arteries and thoroughfares.

Hydroperiod - annual period of inundation.

Hydrological indicators - indicators that may be used as evidence of inundation or saturation when evaluated with meteorological information, surrounding topography, and reliable hydrological data. Indicators include algal mats, aquatic mosses, aquatic plants, aufwachs (microscopic attached organisms), basal scarring, drift lines, elevated lichen lines, evidence of aquatic fauna, morphological plant adaptations, secondary flow channels, sediment deposition, vegetated tussocks and water marks.

Hydrology - water depth, flow patterns, and duration and frequency of inundation as influenced by precipitation, surface runoff and groundwater.

Impervious surface - surface which does not allow for the percolation of water (e.g., asphalt parking lots and roads, rooftops).

Improved pasture – rangeland comprised mostly of introduced pasture grasses. The recommended stocking density for improved pasture is one cow for every five acres of rangeland.

Inappropriate plant species - plant species which are not usually considered nuisance species, however may be indicative of other problems (i.e., improper hydrology) and may dominate a particular stratum (e.g., *Rubus* sp. in a cypress forested wetland). These plant species are not considered appropriate for a particular habitat.

Increased hydroperiod - increase in the annual period of inundation, resulting in a change in the plant community composition and structure, and which can include an increase in the duration and magnitude of inundation.

Indirect impacts - impacts to wetlands such as increased nutrient loading, altered hydrology, impacts to wetland buffer, development of adjacent areas or disturbances by air, light or noise pollution.

Industrial - manufacturing, shipping and transportation operations, sewage treatment plant facilities, water supply plants and solid waste disposal..

Infiltration trench - impoundment in which incoming runoff is temporarily stored until it gradually leaves the basin by infiltrating into the soils.

Institutional – schools, churches, libraries etc. Runoff concentrations are similar to low intensity commercial.

Intensively maintained - mowed, disked or similarly impacted on more than a semi-annual basis.

Invasive exotic plant species - exotic plant species (e.g., punk tree, Australian pine, Brazilian pepper, old-world climbing fern, etc.) that are invading and disrupting native plant communities in Florida.

Landscape setting - the type of land use that surrounds a wetland (i.e., agriculture, residential, commercial/industrial, undeveloped).

Low density residential - areas with lot sizes greater than one acre or less than one dwelling unit per acre.

Low intensity commercial - areas that receive minimal amounts of traffic volume where vehicles are parked for only a portion of the day; such areas include professional office sites and convenience stores.

Low intensity land use - land uses such as low density residential, citrus and low intensity commercial.

Low plant biomass density - minimal accumulation of living or dead plant material due to numerous factors including excessive burning, mowing, grazing, recent vegetation installation, inappropriateness of planted species, improper hydrology (including drought) and other human disturbances such as damage by off-road vehicles.

Magnitude of inundation - depth of inundation on an annual basis.

Mining - includes mining excavation, lake construction, and site development activities, resulting in the removal or clearing of vegetation.

Moderately intensive commercial – areas that receive moderate amounts of traffic volume for a portion of the day, such areas include small shopping centers and plazas.

Moderately intensive land use - includes single-family residential, multi-family residential, golf courses and golf course residential communities, industrial projects, highways and agricultural activities such as pasture and row crops.

Multi-family residential - residential land use consisting primarily of apartments, condominiums and cluster homes.

Non-invasive exotic plant species - exotic plant species which have not yet been shown to be invasive to natural communities.

Nuisance plant species - plant species which have the potential to dominate disturbed or created plant communities and form large vegetative colonies (e.g. cattails, spatterdock, primrose-willow).

Open space / natural undeveloped area – areas that are not developed and exhibit minimal human impact, such areas include parks and passive recreational areas.

Pretreatment or MSSW systems - constructed systems designed to pretreat water (i.e., remove suspended solids and reduce nutrient concentrations) prior to discharge. Systems can range in simplicity from grass swales and dry retention to secondary treatment and polishing ponds.

Proc GLM - Procedure General Linear Model.

Recreational – areas which have been developed for active recreational use (e.g, ballfields, soccer fields, tennis and volleyball courts, etc.). These areas typically have intensive ground maintenance programs.

Routinely maintained - mowed or similarly impacted on an annual basis.

Row Crops – agricultural practice of crops planted and harvested on an annual basis, excluding sugar cane (i.e., vegetable farms and plant nurseries).

SAS – Statistical Application Software.

Secondary productivity - macroinvertebrates, fishes and wildlife.

Single-family residential - detached dwelling units with lot sizes less than one acre and dwelling unit densities greater than one dwelling per acre; duplexes constructed on one-third to one-half acre also included.

Subcanopy - the plant stratum composed of all woody plants and palms with a trunk or main stem diameter at breast height (4.5') between one and four inches, except vines.

Undesirable plant species – exotic, nuisance or undesirable plant species for a given habitat.

Unimproved pasture - comprised mostly of native rangeland. The recommended stocking density is one cow per twenty-five acres of rangeland.

Wet detention areas- impoundments in which stormwater runoff is temporarily stored until it gradually leaves through an outflow control structure. A pool of water remains after a specific bleed-down period.

WETLAND RAPID ASSESSMENT PROCEDURE (WRAP)

1.0 INTRODUCTION

The South Florida Water Management District's (District) former Management and Storage of Surface Waters (MSSW) and current Environmental Resource Permit (ERP) permitting processes have evolved to reflect increasing concern over preserving natural resources. Consequently, recently issued permits have contained a wide assortment of special conditions with varying degrees of emphasis on environmental protection. The District's post-permit compliance inspections indicate that determining permit compliance is generally a straight-forward process, but does not necessarily reflect successful enhancement, mitigation or preservation of a wetland/upland site.

Wetland Rapid Assessment Procedure (WRAP) is a matrix developed to assist in the regulatory evaluation of wetland sites that have been created, enhanced, preserved, or restored through the District's MSSW or ERP processes. This standardized matrix can be used in combination with professional judgment to provide an accurate and consistent evaluation of wetland sites. The evaluator must have a good understanding of Florida ecosystems (functions and species identification) in order for WRAP results to be valid. This current version of WRAP is the fifteenth version developed over a period of four years. Earlier versions indicated greater disparities in overall WRAP scores as a result of inadequate calibration descriptions for the variables. Once these disparities were identified, the calibration descriptions were rewritten and the procedure was retested. Over 400 observations were used to field test and refine the descriptions of the variables prior to the final testing of the procedure.

The WRAP matrix establishes a numerical ranking for individual ecological and anthropogenic factors (variables) that can strongly influence the success of mitigation projects. The numerical output for the variables is then used to evaluate the current wetland condition. The matrix can be used to evaluate a wide range of wetland/upland systems (e.g., emergent marsh, wet prairie, hardwood swamp, wet pine flatwoods etc.) but it is not intended to compare different wetland community types to each other (i.e., marsh to wet prairie). Each wetland type is rated according to its attributes and characteristics. Although an interactive association among variables does exist, variables within the matrix have not been individually weighted. Individual variables can be eliminated from the evaluation if the evaluator determines the specific parameter is not applicable.

Use of the WRAP matrix is intended to accomplish a number of objectives: to establish a simple, accurate, consistent and timely regulatory tool; to track trends over time (land use vs. wetland impacts) and to offer guidance for environmental site plan development.

WRAP is not a substitution for applied research science. It is a tool that can be used by the regulatory community to ensure consistency and accuracy when evaluating a site through the regulatory process of resource permitting and post permit compliance. WRAP can be used as a tool to document baseline information for a site prior to development activities. WRAP input data consist primarily of field observations and professional experience. Some variables, such as exotic and nuisance plant coverage and adjacent upland/wetland buffer, can be quantified through interpretations of aerial photography or visual estimations.

2.0 METHODOLOGY

WRAP incorporates concepts from the U.S. Fish and Wildlife Service's "Habitat Evaluation Procedures" (HEP, 1980) and the South Florida Water Management District's "Save Our Rivers Project Evaluation Matrix" (SOR, 1992).

Ecological communities (i.e., pine flatwoods, wet prairie, cypress dome, etc.) and their associated attributes provide food, cover and breeding sites for a variety of flora and fauna. The holistic concept of HEP is used to evaluate entire systems - both upland and wetland - and their interactive associations. HEP is based on the assumption that the value of a habitat can be evaluated at the species level by using a set of measurable variables that are important for a particular species. The use of HEP is restricted by the number of species models that have been developed and those species chosen for evaluation.

The SOR matrix was developed as a method of evaluating habitats to prioritize the allocation of taxpayer dollars toward acquisition, restoration and management of sensitive lands. The matrix is used to evaluate sites using variables such as water management value, water supply potential, site manageability, habitat and species diversity, connectiveness, rare and endangered species, site vulnerability and human use.

The U.S. Fish and Wildlife Services "Habitat Suitability Index" was utilized in determining specific habitat requirements for the fauna of Florida. This information has been included in Appendix A (Species Habitat Requirement Table) as a resource for evaluating the wildlife utilization variable of WRAP. In addition, community profiles for sites to be evaluated using WRAP are described in Appendix B. Common freshwater fishes and aquatic insect taxa associated with the specific habitats are found in appendices C and D, respectively.

WRAP variables include the following:

- Wildlife Utilization
- Wetland Overstory/Shrub Canopy of Desirable Species
- Wetland Vegetative Ground cover of Desirable Species
- Adjacent Upland/Wetland Buffer
- Field Indicators of Wetland Hydrology
- Water Quality Input and Treatment Systems

2.1 METHODOLOGY FOR USING WRAP

OFFICE EVALUATION

The WRAP evaluator completes the following steps before leaving the office:

1. Identify the project site. Acquire an aerial map for field use and delineation of the project boundaries.

2. Identify land uses adjacent to the project site (see Glossary for land use definitions).
 - a. Identify developmental encroachment and type.
 - b. Identify adjacent natural areas and plant communities using aerial photography.
 - c. Identify roads, canals and other features (i.e., wellfields, etc.) potentially isolating or impacting the site.
 - d. Identify any water quality pre-treatment systems.
3. Identify wetland areas within the project site.
 - a. Label wetland areas for future WRAP scoring.
 - b. Utilize soil maps to verify or identify depressional map units that may not be readily apparent from aerial maps.
 - c. Identify wetland types (i.e. cypress domes, wet prairie etc.) if possible. This may need to be done at the time of the site visit.
 - d. Identify access points to wetland areas.
 - e. Identify canals and ditches adjacent to the wetland areas.
 - f. Set up potential transects through wetland ecotypes. Transects would be warranted if a particular wetland exhibited a number of vegetative community types. The transects could then be used for future monitoring events, if required by the permit.
 - g. Identify any wildlife studies that have been conducted on the site or on adjacent areas.

In addition, the evaluator should review on-site hydrology, site management, maintenance plans, seasonal variability, droughts, fire and excessive rainfall and any other pertinent information.

FIELD EVALUATION

1. Walk a minimum of 50% of the wetland perimeter.
2. Visually inspect 100% of the wetland perimeter.
 - a. Look for signs of wildlife utilization (tracks, scats etc.) including direct observations.
 - b. Identify plant community composition (visual estimate) using predetermined transect (if necessary).
 1. Conduct a visual estimate of the plant species coverage and composition (including exotic and nuisance plants) for the wetland and adjacent areas.
 2. Note any shifts in plant communities such as encroachment of upland or transitional plant species into the wetland.
 - c. Identify any hydrologic indicators present (see Glossary for list).
3. Document field observations on field data sheet (Section 2.3.1) to establish baseline information for future reference.

WRAP SCORE

Score each wetland for the six variables using the guidelines presented below.

2.2 METHODOLOGY FOR SCORING AND ASSESSING HABITAT VARIABLES

Methodology for the Habitat Assessment Variable, is a series of discussions - one for each WRAP assessment variable. Following each description is a matrix containing a set of calibration descriptions and corresponding score points. A score of 3 is considered the best a system can function and 0 is for a system that is severely impacted and is exhibiting negligible attributes.

Each system must be evaluated on its own attributes and is not to be compared to a different type of system (i.e. wet prairie vs. marsh vs. cypress dome). An evaluator also has the option to score each parameter in half (0.5) increments. This provides the flexibility to score a variable that is not accurately described or fitted by the calibration description. Half increments are utilized on the point scale from 0.5 through 2.5.

If any variable does not apply to the habitat being rated, then the designation "NA" (not applicable) can be applied. When the designation "NA" is used for a specific variable it is omitted from the final calculations used to rate the habitat.

Each applicable variable is scored: the scores are totaled ($\sum V$) and then $\sum V$ is divided by the total of the maximum score for that variable ($\sum V_{\max}$). The final rating score for "Habitat Assessment Variables" will be expressed numerically with a number between 0 and 1. The final rating score can be expressed mathematically as follows:

$$\text{WRAP Score} = \frac{\text{sum of the scores for the rated variables (V)}}{\text{sum of maximum possible scores for the rated variables (V}_{\max})}$$

also expressed as:

$$\frac{\sum V}{\sum V_{\max}}$$

2.2.1.1 WILDLIFE UTILIZATION

Introduction

Wetlands provide many species of wildlife with basic life sustaining needs such as water, food (i.e. macroinvertebrates and other wetland dependent species including plants) and nesting and roosting areas. While some animal species prefer uplands for nesting and rearing of young, their primary food sources are found within wetland systems. Water dependent species such as fish, some amphibians and birds have specific requirements with regard to duration and magnitude of hydrologic inundation in order to complete their life cycles. Not all wetland systems (e.g., hydric pines) provide habitat for extended hydroperiod dependent species.

It is important for the evaluator to understand the basic habitat requirements of south Florida fauna to know which species or signs might be observed during site visits. Appendix A lists the habitat requirements for a number of wildlife species found in south Florida. Included are food sources, protective cover, reproductive needs and habitat size. Appendices B (Habitat Community Profiles), C (Common Freshwater Fishes of Southern Florida) and D (Common Aquatic Insect Taxa) list additional wildlife species. In addition to these references, the evaluator should use any pertinent wildlife study with regards to the site or adjacent areas.

Though direct observation of wildlife utilization is ideal, it is not always possible due to the time constraints of the regulatory review process and the secrecy, mobility, habits and seasonality of many species of wildlife. The evaluator must rely on the presence of signs, including scat, tracks, rubs, and nests etc. In some instances an evaluator may have to assume that if habitat needs for a particular species are present then this species probably does frequent the site.

It is recommended that the evaluator use a D-frame dip net to determine if macroinvertebrates are present. Several sweeps through the wetland vegetation, in combination with direct observations of surface dwelling species, should provide an indication of the lower trophic levels. The presence and diversity of macroinvertebrates are quite variable depending on environmental factors such as temperature, pH, predation, and seasonality. During the dry season, the evaluator should look for available signs such as crayfish burrows and remnant exoskeletons of crayfish, dragonflies and apple snail shells. If those signs are not present, the reviewer must utilize the presence of wetland plant species as the primary indicator of on-site hydrology, influencing potential macroinvertebrate populations.

In this procedure, rabbits and rodents are considered small mammals; fox, opossum and raccoon are medium-sized mammals; and bobcat, otter, deer, bear and panther are large mammals. It is recognized that although some species (e.g., raccoon) have adapted well to urban encroachment, they also remain an intricate part of natural communities. Exotic animal species such as feral hogs are considered disruptive to natural systems, but that is not addressed in this procedure.

In order for a score of 3 to be achieved for a wetland site, the system must provide habitat for all levels of the foodchain associated with that particular system.

2.2.1.2 WILDLIFE UTILIZATION MATRIX

Objective

The wildlife utilization variable is a measure of observations and signs (i.e. scat, tracks etc.) of wildlife, primarily wetland dependent species. In addition, potential wildlife use through the presence of wildlife food sources, nesting areas, roosting areas, den trees and protective cover is also considered.

Score

EXISTING WETLAND EXHIBITS NO EVIDENCE OF WILDLIFE

0

- Existing wetland is heavily impacted.
- No evidence of wildlife utilization.
- Little or no habitat for native wetland wildlife species.

EXISTING WETLAND EXHIBITS MINIMAL EVIDENCE OF WILDLIFE UTILIZATION

1

- Minimal evidence of wildlife utilization.
- Little habitat for birds, small mammals and reptiles.
- Sparse or limited adjacent upland food sources.
- Site may be located in residential, industrial or commercial developments with frequent human disturbances.

EXISTING WETLAND EXHIBITS MODERATE EVIDENCE OF WILDLIFE UTILIZATION

2

- Evidence of wetland utilization by small or medium-sized mammals and reptiles (observations, tracks, scat).
- Evidence of aquatic macroinvertebrates, amphibians and/or forage fishes.
- Adequate adjacent upland food sources.
- Minimal evidence of human disturbance.
- Adequate protective cover for wildlife.

EXISTING WETLAND EXHIBITS STRONG EVIDENCE OF WILDLIFE UTILIZATION

3

- Strong evidence of wildlife utilization including large mammals and reptiles.
- Abundant aquatic macroinvertebrates, amphibians and/or forage fishes.
- Abundant upland food sources.
- Negligible evidence of human disturbance.
- Abundant cover and habitat for wildlife within the wetland or adjacent upland.

2.2.2.1 WETLAND OVERSTORY/SHRUB CANOPY OF DESIRABLE SPECIES

Introduction

The wetland overstory/shrub canopy variable is a measure of the presence, health and appropriateness of wetland shrub and overstory canopy. Canopy is defined as the plant stratum composed of all woody plants and palms with a trunk four inches or greater in diameter at breast height (4.5'), except vines (Department of Environmental Protection, 1994). Subcanopy (which includes shrubs) is that plant stratum composed of all woody plants and palms with a trunk or main stem diameter at breast height (4.5') between one and four inches, except vines (Department of Environmental Protection, 1994). However, WRAP does include species of vines that may impact the overall health of the overstory/shrub canopy (air potato, old-world climbing fern, grapevine, etc.).

Most of these wetland plant species have adapted to a restricted range of hydrologic regimes (South Florida Water Management District, 1995). Wetland overstory/shrub canopy provides many benefits to wildlife species such as cover, food, nesting and roosting areas. Wetlands can vary dramatically in the composition and density of overstory/shrub canopy species (Appendix B). This variable should be used when there is significant overstory/shrub canopy (i.e., the coverage of canopy/shrub species should exceed twenty percent of the overall wetland acreage). The variable can also be used when there is potential (i.e. immature) canopy present or for a forested wetland that has been clear cut (silviculture).

WRAP categorizes the overstory/shrub canopy species into few, moderate and abundant trees present. Using these categories the reviewer evaluates the areal coverage and density of the overstory/shrub canopy for a particular wetland.

Certain wetland types characterized as deep-water marsh and wet prairie systems may exhibit limited or no canopy or shrub species (Myers, 1990, and Soil Conservation Service, 1987). In such situations, the variable would be designated "NA" (not applicable) and omitted from the final calculations.

The overall condition of an overstory/shrub canopy can be evaluated by observing indicators such as the presence of a large percentage of dead or dying trees or shrubs, soil subsidence, little or no seedling regeneration and the presence of an inappropriate understory plant species. Although short-term environmental factors such as flooding, drought and fire (Beever, unpublished) can temporarily impact the health of canopy, human activities such as flooding (i.e., stacking water in retention systems) or draining systems via ground water withdrawal and conveyance canals can permanently damage these systems.

Exotic and nuisance (E&N) plant species have become a serious problem in south Florida, outcompeting and replacing native plant communities. Wetlands containing E&N plant species are impacted in various ways depending on the type of wetland and the degree to which it is infested. There are approximately 200 species of exotic plants currently listed by the Florida's Exotic Pest Council's 1995 *List of Florida's Most Invasive Species*. WRAP has identified 20 species that most commonly occur in southern Florida; the species are listed in Appendix E. Many of the listed species can be found invading Florida wetlands. The predominant E&N species are: melaleuca, Brazilian pepper, old-world climbing fern and cattail.

The punk tree (*Melaleuca quinquenervia*) is an aggressive exotic tree that has infested tens of thousands of acres of south Florida wetlands. As melaleuca infests a wetland it changes the characteristics of the ecological community. Once established, melaleuca greatly reduces and in many cases eliminates the native understory of plant species.

Brazilian pepper (*Schinus terebinthifolius*) is another aggressive exotic tree that is rapidly spread by seed (birds and mammals). The largest populations occur on disturbed sites such as abandoned wet agricultural fields and canal banks. Brazilian pepper grows into dense thickets, reducing nesting areas and foraging areas for wildlife utilization (Myers and Ewel, 1990) and shading out native plant species.

The old-world climbing fern (*Lygodium microphyllum*) can greatly impact wetland groundcover, shrub strata and overstory strata. *Lygodium* can blanket an area, greatly reducing (by shading) or eliminating native plant species and severely impacting wildlife utilization. In addition, the fern can act as a conduit for fire to reach the tree canopy resulting in extensive damage or death of the tree.

2.2.2.2 WETLAND OVERSTORY/SHRUB CANOPY OF DESIRABLE SPECIES MATRIX

Objective

The wetland overstory/shrub canopy variable is a measure of the health and appropriateness of the wetland shrub and overstory canopy. The functional assessment of the canopy strata is objectively evaluated based on food resources, cover, nesting potential, and appropriateness of the vegetative community. The canopy stratum is evaluated based on the habitat type. This variable may not be applicable to freshwater marsh and wet prairie habitats where overstory/shrub canopy is typically not present (less than 20%). By definition, undesirable plant species include exotic and nuisance plant species.

Score

NO DESIRABLE WETLAND OVERSTORY/SHRUB CANOPY TREES PRESENT 0

- No desirable wetland trees or shrub species.
- Negligible or little habitat support (i.e., roosting, nesting and foraging) from seedling trees (if present).
- Site subject to recent clear cutting with little evidence of native canopy plant regeneration.
- Greater than 75% undesirable plant species (including E&N species).

MINIMAL DESIRABLE WETLAND OVERSTORY/SHRUB CANOPY TREES PRESENT 1

- Large amounts (approx.. 50%) of undesirable tree or shrub species.
- Wetland overstory/shrub canopy immature but some potential for habitat support.
- Minimal signs of natural recruitment of native canopy and shrub seedlings.
- Few snags, or if many present, it may be an indication of hydrology problems or environmental impacts.
- Disease or insect damage in live canopy trees.

MODERATE AMOUNT OF DESIRABLE WETLAND OVERSTORY/SHRUB CANOPY TREES PRESENT 2

- Few (less than 25%) undesirable canopy trees/shrubs.
- Wetland overstory/shrub canopy is providing habitat support.
- Some evidence of natural recruitment of native canopy/shrub seedlings.
- Few snags or den trees.
- Healthy live canopy trees with minimal evidence of disease or insect damage.

ABUNDANT AMOUNT OF DESIRABLE WETLAND OVERSTORY/SHRUB CANOPY TREES PRESENT 3

- No exotic and less than 10% invasive canopy/shrub species present.
- Good habitat support provided by wetland overstory/shrub canopy.
- Strong evidence of natural recruitment of native canopy and shrub seedlings.
- Few snags or den trees.
- Healthy live canopy trees with minimal evidence of disease or insect damage.

2.2.3.1 WETLAND VEGETATIVE GROUND COVER OF DESIRABLE SPECIES

Introduction

The ground cover variable is a measure of the presence, condition and appropriateness of the wetland ground cover. Ground cover will be defined as the plant stratum composed of all plants not found in the canopy or subcanopy, including vines. Ground cover vegetation can provide a refuge for macro-invertebrates, fish fry, reptiles, amphibians, small mammals and also can provide a food source for small mammals, waterfowl and reptiles.

Ground cover vegetation can be classified into herbaceous, graminoid, non-graminoid and woody species. Ground cover can also be characterized according to growth form such as emergent, floating-leaf, submersed and free-floating surface. Most wetland species have adapted to a restricted range of hydrologic regimes (South Florida Water Management District 1995). Species composition of groundcover varies among ecosystems although many species overlap (Appendix B).

The health and abundance of wetland ground cover (particularly herbaceous) can be significantly affected by extremes in wetland hydrology. Deepwater conditions created by improper wetland control elevations or natural variability can drown wetland plant species. Conversely, drawdown of wetlands (due to wellfields and adjacent canals) and natural variability can reduce the presence of many wetland species and allow for the encroachment of more upland/transitional species. The health of the vegetation can also be evaluated in terms of plant robustness. If the plants are chlorotic or spindly (provided they aren't just planted), it may be a sign of nutrient deficiency, improper soils or hydroperiod response.

Human activities (including hydrologic impacts and extensive nutrient inputs) can promote significant changes in wetland ground cover. Mowing of herbaceous and graminoid wetlands for aesthetics can interfere with seed production of certain plants. Grazing by cattle can influence the species composition of some wetlands due to the introduction of nuisance species of plants (i.e., torpedograss and other invasive grasses are tolerant of higher nutrient loads). In addition, cattle grazing and off-road vehicle traffic in wetlands create soil disturbance and compaction, as well as the destruction of native vegetation.

As previously noted, exotic and nuisance plant species have become a serious problem in south Florida by outcompeting and replacing native plant communities. Exotic and nuisance plant species such as torpedograss (*Panicum repens*), primrose willow (*Ludwigia species*), old-world climbing fern, and cattail (*Typha species*) can be extremely invasive and disruptive to the groundcover of wetland systems. E & N plant species are to be considered when evaluating this variable.

2.2.3.2 WETLAND VEGETATIVE GROUND COVER OF DESIRABLE SPECIES MATRIX

Objective

The vegetative ground cover variable is a measure of the presence, abundance, appropriateness and condition of vegetative ground cover within the wetland. By definition, undesirable plant species include exotic and nuisance plant species.

	<u>Score</u>
NO DESIRABLE VEGETATIVE GROUND COVER IS PRESENT	0
<ul style="list-style-type: none">• Ground cover is greater than 75% undesirable vegetation.• Vegetative ground cover is intensively maintained, managed or impacted.• Site a freshly mulched created mitigation area with no evidence of seed germination.	
MINIMAL DESIRABLE VEGETATIVE GROUND COVER IS PRESENT	1
<ul style="list-style-type: none">• Ground cover exhibits large amounts (approx. 50%) undesirable vegetation.• Ground cover routinely managed for either aesthetics or agricultural production.• Site a newly planted mitigation area with low plant biomass density.• Site newly mulched with signs of seed germination.	
MODERATE AMOUNT OF DESIRABLE VEGETATIVE GROUND COVER IS PRESENT	2
<ul style="list-style-type: none">• Few undesirable groundcover plant species are present (less than 25%).• Ground cover slightly impacted (human induced effects).• Mulched or planted areas established with desirable native plant species.	
ABUNDANT DESIRABLE VEGETATIVE GROUND COVER IS PRESENT	3
<ul style="list-style-type: none">• Less than 10% nuisance and inappropriate plant species with no exotic plant species.• Minimal or no disturbances to ground cover.• Area subjected to either managed or natural periodic burns for enhancement of ground cover.	

2.2.4.1 ADJACENT UPLAND/WETLAND BUFFER

Introduction

The adjacent upland/wetland buffer variable is a measure of the adjacent habitat support for the subject wetland. This variable is evaluated based on the adjacent buffer size and the ecological attributes (i.e., sediment removal, nutrient uptake, cover, food source, and roosting areas) the buffer area is providing for the wetland system that is being assessed.

Wetland systems are subjected to disturbances that originate in adjacent upland areas. These disturbances can impact biological, chemical and physical attributes of wetlands (Castelle, et al, 1994). Buffers are vegetated areas located between the jurisdictional wetland line and adjacent areas subject to human disturbance. Adjacent wetlands also serve as wetland buffers. Buffers may consist of areas that are undisturbed native vegetation, areas wholly or partially cleared and revegetated, or areas with varying degrees of exotic and nuisance vegetation.

The criteria for determining adequate buffer sizes should be partly based on the quality of the wetland and the intensity of the adjacent land use (Castelle, et al, 1992). Smaller buffers are more acceptable when the adjacent land use is low intensity. Larger buffers are necessary when the adjacent land use intensity is high and the quality of the buffer is low. Buffers provide benefits to wetlands through sediment control (Shisler, et al, 1987), removal of excess nutrients and metals from runoff by both physical filtration and plant uptake (Madison, et al, 1992), and maintenance of habitat diversity for animal species that require the adjacent upland buffer to meet specific habitat needs (Naiman, et al, 1988).

Buffers also form a transitional zone between the wetland and the adjacent development. The edge effect theory proposes that the numbers of plant and animal species increase at the edge, due to overlap of adjacent habitats and the creation of unique edge-habitat niches (Castelle, et al, 1994). Finally, buffers can act to reduce direct human impact by reducing access to the wetland and blocking noise and light pollution.

Castelle, et al, (1994) state that buffers less than 15-30 feet provide little protection for aquatic resources. Buffers should be a minimum of 45-90 feet under most conditions. The lower range (45 feet) is necessary for maintenance of physical and chemical protection, while the upper range (90 feet) is a minimum for the protection of biological components. Habitat Suitability Index models have demonstrated the need for buffers between 10 and 350 feet depending on the resource needs of the particular species.

Buffer quality is also very important. A good buffer might contain a mixture of native tree, shrub and ground cover plant species. This would provide a visual and sound barrier for the wetland as well as a food source, cover and nesting habitat for wildlife species. In addition, the ground cover plant species would act as a filtration system for incoming surface water. An example of a low quality buffer would be a ring of dense Brazilian pepper around the wetland. The dense growth of the pepper allows little wildlife utilization. In addition, little or no ground cover can grow in the dense shade.

Large buffers (greater than 300 feet) consisting primarily of pasture grasses may provide spatial protection and some sediment control for wetlands. However, these types of buffers provide less benefit as cover, food source and roosting areas than a good quality buffer.

This procedure considers high volume traffic roads or highways as a severance to existing buffers. Low volume traffic roads (i.e., dirt maintenance or fire break roads) are considered as a continuation to the existing buffer.

2.2.4.2 ADJACENT UPLAND /WETLAND BUFFER MATRIX

Objective

The adjacent upland /wetland buffer variable is a measure of the area adjacent to the subject wetland and the landscape setting of the wetland. This variable is evaluated based on the adjacent buffer size and the ecological attributes (i.e. cover, food source and roosting areas for wildlife) that this area is providing in association with the wetland that is being assessed.

Score

NO ADJACENT UPLAND/WETLAND BUFFER

0

- Buffer non-existent.

ADJACENT UPLAND/WETLAND BUFFER AVERAGES 30 FEET OR LESS, CONTAINING DESIRABLE PLANT SPECIES

1

- Less than 30 feet average width.
- Mostly desirable plant species which provide cover, food source, and roosting areas for wildlife.
- Not connected to wildlife corridors.
- Greater than 300 feet but dominated (greater than 75%) by invasive exotic or nuisance plant species.

ADJACENT UPLAND/WETLAND BUFFER AVERAGES GREATER THAN 30 FEET BUT LESS THAN 300 FEET, CONTAINING PREDOMINANTLY DESIRABLE PLANT SPECIES

2

- Greater than 30 feet but less than 300 feet average width.
- Contains desirable plant species which provide cover, food, and roosting areas for wildlife.
- Portions connected with contiguous offsite wetland systems, wildlife corridors.
- Greater than 300 feet but dominated (greater than 75%) by undesirable noninvasive plant species (e.g., pasture grasses).

ADJACENT UPLAND/WETLAND BUFFER AVERAGES GREATER THAN 300 FEET CONTAINING PREDOMINANTLY DESIRABLE PLANT SPECIES

3

- Greater than 300 feet wide average width.
- Contains predominantly desirable plant species (less than 10% nuisance, and no exotic species) for cover, food, and roosting areas for wildlife.
- Connected to wildlife corridor or contiguous with offsite wetland system or areas that are large enough to support habitat for large mammals or reptiles.

2.2.5.1 FIELD INDICATORS OF WETLAND HYDROLOGY

Introduction

Wetland hydrology can be a difficult variable to evaluate given the limited timeframes associated with the regulatory process. Several field indicators enable an evaluator to make inferences with regard to wetland hydrology. The duration and magnitude of inundation within a wetland system can be estimated based on plant morphological responses, plant community structure and soil morphology.

Plant Morphological Responses - Several wetland plant species have developed morphological adaptations that enable them to survive extended periods of inundation. Many wetland tree and shrub species develop adventitious roots as a response to the duration of inundation. Extended periods of inundation promote the development of these secondary roots along the basal stem of the plant. Adventitious roots are formed when the primary root stock is inundated to the extent that anaerobic conditions severely reduce root oxygen and nutrient transport. In addition, recent cypress tree knee growth is an indication of extended inundation. The bark on the apex of the knee will be spread exposing light brown or tan new growth tissue.

Other indicators include small plant species that colonize on trunks of trees at the seasonal high water line. These hydrologic indicators can be used to assist in the determination of the magnitude of inundation (Hale, 1984). Lichen lines colonize down to the seasonal high water mark. Conversely, moss collars predominantly colonize up to the seasonal high water mark.

Plant Community Structure (PCS) - The plant community structure is a composition of the ground cover and the overstory/shrub canopy. The plant community structure (PCS) can be used to make inferences about hydrologic impacts resulting from an increased or a reduced hydroperiod. The evaluator uses the PCS to assess the plant species for a specific habitat. Plant community profiles associated with specific wetland habitats for use with this procedure are in Appendix B. Although this list is not inclusive, it includes plant species typically associated with a specific wetland system.

Transitional plant species such as slash pine (*Pinus elliottii*), wax myrtle (*Myrica cerifera*) and saltbush (*Baccharis halimifolia*) encroaching into the wetland can be cautiously used as evidence of recent decreases in the hydroperiod (Rochow, 1994, and Mortellaro, et al, 1995). Evaluation of these transitional tree and shrub species allows an observer to make some inference about the wetland hydroperiod over the last 1 - 3 years. When evaluating the ground cover plant community, the evaluator should remember that transitional changes within the plant community can occur within one year (Thibodeau and Nickerson, 1985). Care must be taken to distinguish effects of recent drought from more permanent impacts on hydrology.



Conversely, some wetland systems can be impacted by an increased hydroperiod. For example, an increased hydroperiod for a wet prairie will result in an extensive die-off of St. Johns Wort. This particular plant species is then replaced with deeper marsh plants such as maidencane (*Panicum hemitomon*), water lilies (*Nymphaea odorata*) and cattails. In addition, if forested wetland systems are maintaining a proper hydroperiod, then seedling regeneration will be occurring either in openings within the canopy or on the periphery of the systems.

Before making accurate inferences about a reduced or increased hydroperiod, the evaluator should determine that the natural variability (e.g., extended droughts, excessive rainfalls, fires, etc.) is not causing the observed plant community response. Having knowledge of the average annual rainfall for the last 3 - 5 years will assist an evaluator with regard to this variable.

Soil Morphology - Soil morphology is used to evaluate soil development and characteristics. A reduced hydroperiod has a direct impact on organic soil development and can result in soil subsidence due to oxidation (Synder and Davidson, 1994). When significant oxidation occurs there may be tree falls, excessive tree leanings, exposed roots at trunk bases and gaps beneath cypress knees.

Alteration of Wetland Hydrology - Human induced impacts that can alter the hydrology of wetland systems include roads, drainage canals, levees, wellfields and changes to the drainage basin. These alterations typically manifest themselves in a noticeable shift in the wetland vegetative community. Roads can interrupt historical sheetflow patterns and decrease the amount of contributing basin to a wetland system or can block the natural flow and over-inundate the system. Drainage canals and wellfields are designed to move volumes of water from one area to another, whether it is for flood control or consumption. Both systems have hydrological cones of influence. The permeability of soils and the underlying geology in the vicinity of the wetland will determine the amount of drawdown these activities will cause in a wetland.

Changes to the contributing drainage basin can include increasing the amount of impervious surface (i.e., roofs, roads, parking lots, etc.) which in turn can increase the amount of water entering the wetland. This increase in hydrological input is sometimes accompanied by large decreases in the delivery time to the system which may result in wide fluctuations in water level thus affecting the survivorship or overall health of the plant species. Conversely, project construction can decrease the size of the contributing basin, thus decreasing hydrological inputs.

Wetland systems in agricultural land use settings are sometimes preserved within retention areas. Adverse impacts can occur to these wetlands through the stacking of water (holding water levels above control elevation) or pumping too much water into the system. Both of these activities can drown or shift the species composition of the wetland.

2.2.5.2 FIELD INDICATORS OF WETLAND HYDROLOGY MATRIX

Objective

This variable is a measure of the hydrologic regime based on observed field indicators for the subject wetland including hydroperiod duration and magnitude. Wetland hydrology is generally interpreted using vegetative indicators. In addition, hydrologic indicators such as lichen lines, algal mats, adventitious roots and basal scarring are also utilized. Signs of altered hydrology may include encroachment of upland and transitional plant species into the wetland.

Score

HYDROLOGIC REGIME HAS BECOME SEVERELY ALTERED WITH STRONG EVIDENCE OF SUCCESSION TO TRANSITIONAL/UPLAND OR OPEN WATER PLANT COMMUNITY

0

- Wetland hydrology severely altered.
- Hydroperiod inadequate to support wetland plant species for the particular community type.
- Strong evidence that upland plants are encroaching into the historical wetland area as a result of a decreased hydroperiod.
- Die-off of wetland plant species as a result of an increased hydroperiod.
- In sites with an organic soil substrate, there is substantial soil subsidence.

HYDROLOGIC REGIME INADEQUATE TO MAINTAIN A VIABLE WETLAND SYSTEM

1

- Site hydroperiod inadequate to maintain the system that is being created, enhanced or preserved.
- Succession of wetland plant species into transitional/upland plant species. Appropriate vegetation stressed or dying from too much or too little water.
- In sites with an organic soil substrate, there is evidence of soil subsidence.

HYDROLOGIC REGIME ADEQUATE TO MAINTAIN A VIABLE WETLAND SYSTEM. EXTERNAL FEATURES MAY AFFECT WETLAND HYDROLOGY

2

- Wetland hydroperiod adequate, although conditions possibly interfering with or influencing the hydroperiod of site (i.e., canals, ditches, swales, berms, reduced drainage area, culverts, pumps, control elevation and wellfields) present.
- Plants healthy, and exhibit no stress from too little water or too much water.
- In sites with an organic soil substrate, there is little evidence of soil subsidence.

HYDROLOGIC REGIME ADEQUATE TO MAINTAIN A VIABLE WETLAND SYSTEM

3

- Plants healthy with no stress resulting from an improper hydroperiod.
- Wetland exhibits a natural hydroperiod.
- Wetland not adjacent to canals, ditches, swales, berms, wellfields or other negative impacts to the wetland within the landscape setting.
- In sites with an organic soil substrate, there is no sign of soil subsidence.

2.2.6.1 WATER QUALITY INPUT AND TREATMENT

Introduction

Evaluating water quality within the limited timeframes of the regulatory process is a very difficult task. Without a long term water quality data-set it is virtually impossible to make any accurate inferences about water quality within a wetland system. However, literature review indicated that relatively comprehensive information was available for several water quality constituents including: total nitrogen, total phosphorus, ortho-phosphorus, BOD, TSS, total lead and total zinc (Harvey, 1990).

For these selected constituents, runoff water quality varies with land use (Whalen and Cullum, 1988). The WRAP procedure utilizes nineteen land use categories to evaluate stormwater quality runoff and associated impacts. The land use categories were taken from *Stormwater Loading Rate Parameters for Central and South Florida* (Harvey, 1990). The land use categories used in WRAP include the following: low-density residential, single-family residential, multi-family residential, golf course, low intensity commercial, moderately intensive commercial, high intensity commercial, industrial, institutional, highways, citrus grove, sugar cane, row crops, improved pasture, unimproved pasture / rangeland, dairy and feedlot, mining, recreational, and open space/undeveloped natural areas. Each of these categories is defined in the Glossary. Using these land use designations is an important part of applying this Procedure in the field.

Pollutant loading rates from open space / undeveloped natural areas are much lower than any other category. Loading rates for residential land uses increase steadily for each pollutant category from low-density to single-family to multi-family. These land use categories and their associated loading rates have been used within this Procedure to calibrate the water quality variable. The previously mentioned land use designations represent the vast majority of land uses within central and south Florida.

In addition to land use types, the efficiencies associated with different water management systems to remove pollutants must be considered. Treatment for the pollution in stormwater runoff is required in the state of Florida through the regulatory process. There are several possible treatment methods. Wet detention is the most commonly used mechanism, with approximately 70 percent of the water management systems permitted in south Florida being wet detention systems. Dry detention, and/or retention and some form of infiltration/filtration are the other types of treatment mechanisms that are also commonly used (Whalen and Cullum, 1988).

Wet detention systems which include grass swales achieve up to 90 percent reduction for nutrients and solids. Wet detention basins provide good to excellent pollutant removal efficiencies. The standing water column provides for several physiochemical processes to achieve pollutant removal (Whalen and Cullum, 1988).

Treatment of stormwater by use of dry retention basins is generally considered to be inferior to that achieved by wet detention. The reason for the low removal of pollutants is most likely the absence of a standing water column, which provides a means for more extensive biological treatment (Whalen and Cullum, 1988).

If the treatment system is not operating as designed (i.e., flows bypassing the system, inoperative control structure, non-functional dry retention, impacts from off-road vehicles), the evaluator should consider this information in calculating the parameter score.

The water quality component of WRAP is used to evaluate the adjacent land use type (LU) and its contribution to the surface water budget for the subject wetland. WRAP does not consider groundwater inputs when calculating the water budget for a wetland system. This is due to the difficulties of quantifying and identifying groundwater sources.

The type of surface water management pretreatment (PT) associated with the subject land use is also considered. Both LU and PT are independently assessed and then summed. The summed total is then divided by two to calculate the water quality input and treatment (WQIT) score. Many times either on-site conditions are not accurately described or a combination of land uses exist adjacent to the subject wetland. In these instances the evaluator must evaluate each of the surrounding land use(s), and the surface water management system associated with each land use. For wetland systems that are wholly contained within a single land use, 100% of the water budget will be attributed to that land use.

The WQIT score is mathematically expressed as follows:

$$(\% \text{ surrounding} \times \text{LU1}) + (\% \text{ surrounding} \times \text{LU2}) + \dots (\% \text{ surrounding} \times \text{LU}(n)) = \text{LU total}$$

and,

$$(\% \text{ surrounding} \times \text{PT1}) + (\% \text{ surrounding} \times \text{PT2}) + \dots (\% \text{ surrounding} \times \text{PT}(n)) = \text{PT total}$$

hence,

$$\text{WQIT} = (\text{LU total} + \text{PT total})/2$$

The scores for the PT systems are given with the assumption that the systems are built, operated and maintained in accordance with all applicable regulations and guidelines.

* % expressed as a decimal

2.2.6.2 WATER QUALITY INPUT AND TREATMENT MATRIX

Objective

The water quality variable of the matrix is a measure of the quality of the surface water flowing into the subject wetland from adjacent land uses (LU). The percent and type of surrounding land uses as well as any on-site pretreatment (PT) of surface waters prior to the discharge into wetlands is considered.

The scores for land use types are as follows:

<u>LAND USE CATEGORY*</u>	<u>SCORE</u>
open space / natural undeveloped areas	3
unimproved pasture / rangeland	2.5
citrus grove	2
sugarcane	2
low density residential	2
low intensity commercial	2
institutional	2
single-family residential	1.5
recreational	1.5
golf course	1.5
moderately intensive commercial	1.5
highways	1
industrial	1
mining	1
multi-family residential	1
improved pasture	1
row crop	1
high intensity commercial	0.5
dairy and feedlot	0

*see Glossary for definitions

The scoring increments for treatment systems are as follows:

<u>PRE-TREATMENT CATEGORY</u>	<u>SCORE</u>
natural undeveloped area	3
berms which prevent runoff from entering wetland	2.5
wet detention with swales	2.5
wet detention with dry retention	2.5

PRE-TREATMENT CATEGORY (CONTINUED)**SCORE**

combination grass swales with dry retention	2
turbidity during construction	1.5
wetland system is part of treatment	1.5
grass swales only	1
dry retention only	1
no treatment	0

EXAMPLE FORMULA FOR WATER QUALITY INPUT AND TREATMENT VARIABLE (WQIT)

For the WRAP procedure, the permitted land use (or contributing basin) is considered the primary hydrological input to the wetland system. For example, a wetland is surrounded on 75 % of its perimeter by single-family residential (LU1) and 25% by an institutional land use (LU2). The surface water management systems of both projects discharge into the common wetland. The surface water management system for the single-family development consists of grass swales, and dry and wet detention (PT1). The surface water management system for the institutional land use consists of grass swales and dry detention (PT2). Both surface water management systems have been constructed and maintained in accordance with their permits. For the above example the WQIT would be calculated as follows:

Example: $(\% \text{ surrounding LU1} \times \text{land use category score}) + (\% \text{ surrounding LU2} \times \text{land use category score}) = \text{LU total}$

$$\text{Hence: } (.75 \times 1.5) + (0.25 \times 2.0) = \text{LU total}$$

$$\text{Therefore: } (1.13) + (0.5) = 1.63 = \text{LU total}$$

plus,

$(\% \text{ surrounding LU1} \times \text{pre-treatment category score}) + (\% \text{ surrounding LU2} \times \text{pre-treatment score}) = \text{PT total}$

$$\text{Hence: } (.75 \times 2.5) + (0.25 \times 2.0) = \text{PT total}$$

$$\text{Therefore: } (1.88) + (0.5) = 2.38 = \text{PT total}$$

$$\text{Hence: } (\text{LU total} + \text{PT total}) / 2 = \text{WQIT}$$

$$\text{Therefore: } (1.63 + 2.38) / 2 = 2.0 = \text{WQIT}$$

* % expressed as a decimal

2.3 DESCRIPTION OF FIELD DATA SHEET

When assessing a wetland system using WRAP it is important that the evaluator document site information and field observations on the field data sheet (section 2.3.1). The following is a description of the information required when filling out the field data sheet.

Permit Number - any identification number for the site, either permit number or application number. This number must be inherent to a specific project so it can be used to identify the project area accurately for future assessments.

Project - the project name or parcel name of the wetlands being evaluated.

Date - the date on which the evaluation was conducted.

Evaluator - the name of the individual who preformed the evaluation.

Wetland Type - the type of wetland system (e.g., wet prairie, cypress dome, etc.) being assessed.

Land use - the permitted land use for the subject project.

Wildlife Utilization - a measure of the wildlife utilization within the subject wetland. Noted signs and observations should be documented within the "Comments" section to support the wildlife utilization assessment.

Wetland Canopy - a measure of the overstory/shrub canopy for the subject wetland. Field observations should be documented in the "Comments" section to substantiate the assessment of the wetland canopy variable.

Wetland Ground Cover - a measure of the wetland ground cover for the subject wetland. Field observations should be documented in the "Comments" section to substantiate the assessment of the wetland ground cover variable.

Habitat Support/Buffer - a measure of the habitat buffer for the subject wetland. Field observations should be documented in the "Comments" section to substantiate the assessment of the habitat support/buffer variable.

Field Hydrology - a measure of the field indicators of hydrology for the subject wetland. Field observations should be documented in the "Comments" section to substantiate the assessment of the field hydrology variable.

WQ Input & Treatment - a measure of the water quality input and surface water pre-treatment for the subject wetland. Field observations should be documented in the "Comments" section to substantiate the assessment of the water quality variable.

WRAP Score – the overall functional score for the subject wetland. Each variable score is summed and then divided by the total possible maximum score for the variables (See Section 2.2). The final WRAP score is expressed as a number between zero and one.

2.3.1 WETLAND RAPID ASSESSMENT PROCEDURE FIELD DATA SHEET

Permit Number

Project

Date

Evaluator

Wetland Type

Land Use

Wildlife Utilization (WU)

Wetland Canopy (O/S)

WL Grndcover (GC)

Habitat Support/Buffer

Field Hydrology (HYD)

WQ Input & Trmnt (WQ)

WRAP Score

Comments

WU -

O/S -

GC -

BUFFER -

HYD -

WQ -

3.0 OBJECTIVES OF TESTING THE WRAP PROCEDURE

1. Determine the precision and accuracy of the procedure among individual evaluators using a two-way Analysis of Variance (Anova) of unequal class sizes;
2. Determine if collinearity existed between the WRAP variables;
3. Determine graphically if the functional attributes measured in WRAP respond to human activities.

3.1 DESIGN PROTOCOL FOR WRAP VARIABLE CALIBRATION

The goal of establishing a design protocol for WRAP was to verify that attributes of wetland systems that were being measured responded to human actions. Data were collected and then analyzed both statistically and graphically to attempt to link human activity within project sites to responses within the wetland systems.

Ten land use designations were originally selected in the attempt to determine the degree of impact associated with the wetland variables identified in WRAP. The ten land use designations described in WRAP were as follows:

- Agriculture
- High Intensity Commercial
- Highway
- Industrial
- Institutional
- Low Density Residential
- Low Intensity Commercial
- Multi-Family Residential
- Recreational/Open Space
- Single-Family Residential

A design protocol was implemented within three geographical regions of south and central Florida: the Ft. Myers region, the Orlando region and the West Palm Beach region (which coincide with the location of the District's largest service centers). Evaluators from each of the service centers established three sites for each of the ten different land use designations.

Of the three sites selected for each land use, one was evaluated prior to any development activity, while the other two were within completed permitted projects. Altogether 27 sites were evaluated within each geographical region, for a total of 81 sites District-wide in the initial testing of this protocol.

Evaluations of the three sites per land use prior to development will be used to track trends over time and to document human activities and associated responses of the wetland attributes used in WRAP. In addition, the undeveloped sites will be used to test the validity of WRAP as a predictive tool for

evaluating wetland impacts, as a result of project development. The WRAP prediction scores will be validated as each project is completed and as-built WRAP scores are compared to the predicted scores.

The evaluation of the remaining six sites per land use, constructed projects, will be used to validate whether or not the selected wetland attributes show a response to human influences.

The testing protocol required 3 - 5 evaluators per site to collect the proper data for the statistical analysis. A minimum of 250 data points was selected as the goal for the initial testing of WRAP.

In addition, five wetland types were selected in conjunction with the ten land uses for preliminary testing of the WRAP. The types were selected as representative wetland communities that had been typically impacted by development within each geographic region. The wetland types selected per region were as follows:

Service Center	Wetland Community Type
West Palm Beach	Wet Prairie, Emergent Marsh
Orlando	Cypress Swamp, Mixed Hardwood
Fort Myers	Wet Prairie, Hydric Pines

WRAP evaluators selected testing sites based on the availability of the regional wetland community types and the ten designated land uses. In the future, additional wetland types and adjacent land uses will be evaluated within each region.

WRAP evaluator training consisted of a two-day course. A half a day was spent introducing the Procedure along with selecting training sites for field evaluation. The selected sites were reviewed in the office using the procedures outlined in WRAP. The remaining day and a half was spent in the field evaluating between 6 – 8 sites in accordance with the field evaluation procedures outlined in WRAP.

The collected data are being evaluated graphically by comparing WRAP scores for individual wetland attributes (y-axis) to specific land use designations (x-axis). This will assist in substantiating the selection of each attribute and the way human activities affect it.

Statistically, a two-way Anova of unequal class sizes was applied to the data set. This Anova design was used for each evaluator at each wetland, and the error associated with differences in evaluator scores estimated as a component of variance. When calculating components of variance from an Anova model the variance is partitioned among each of the sources of variance.

The statistical Anova model for WRAP is as follows:

$$\text{WRAP Score} = \text{Wetland}_i + \text{Evaluator}_j + \text{error}_k$$

where: Wetland_i = resource condition at the i th wetland

Evaluator_j = effect of the j th Evaluator

From this model the variance can be estimated for each component. If the variance resulting from differences in the wetlands is much larger than the variance resulting from different evaluators, then the differences in evaluators are not important. If observer variance is large relative to the associated error or site differences, then the protocol needs to be reevaluated.

3.2 RESULTS

Statistical Summary

A total of 303 data points was used in the preliminary testing of WRAP. This included 81 different wetland sites with an average 3-5 evaluators per site, 8 different wetland communities and 19 land use designations.

The data were found to be normally distributed. Preliminary evaluation of the data using SAS procedure Proc GLM was used to determine procedure repeatability (two-way Anova). The analysis results are shown in Table 1.

Table 1. Summary of two-way Anova statistical analysis of WRAP.

Source of variance	p value	% variance
Site	.00001	98.6
Observer	0.7751	-0
Error		1.4
R square = 0.96	Range = 0.31-0.95	Mean = 0.64

The data results indicate the current procedure is highly repeatable among evaluators, with 98.6 % of the variability explained by differences in sites. The variability caused by differences in evaluators was approximately 0. It should be noted that although 3-5 evaluators visited each of the 81 different sites, a total of 17 different evaluators participated in the data collection.

Analysis for multicollinearity and correlation among the variables yielded no significant correlations. Although the testing has indicated no correlation among the variables, the authors have chosen to eliminate the Exotic and Nuisance Plant variable as a separate variable and incorporate its components into the Wetland Overstory/Shrub Canopy, Wetland Vegetative Ground Cover and Adjacent Upland/Wetland Buffer variables. This change will eliminate some of the confusion in using the procedure and in the perception that the presence of exotic and nuisance plant species has been unfairly weighted.

During the development and testing of WRAP it became apparent that this type of procedure is an effective wetland functional training tool for small groups (< 6 people). In many instances, the groups consisted of individuals with different areas of expertise. This resulted in significant and open discussion about each variable. A comment frequently heard during the testing of WRAP was that the procedure requires the evaluator to evaluate each variable independently. This may assist in eliminating personal bias when evaluating wetland systems.

Additional graph analysis is being used in an attempt to determine how the functional attributes measured in WRAP respond to human induced activities.

4.0 SUMMARY

As indicated by the statistical results, WRAP is a repeatable assessment procedure. The majority (98.6%) of the error associated with the analysis was with differences between sites, not evaluators. The development of any functional assessment procedure requires an iterative process to assess a wide assortment of field conditions.

In addition, each individual variable was shown to be independent. The authors have chosen to eliminate the Exotic and Nuisance Plant variable and incorporate its components into the Wetland Overstory/Shrub Canopy, Wetland Vegetative Ground Cover and Adjacent Upland/Wetland Buffer variables to reduce confusion in using the assessment procedure.

The overall objective in the development of WRAP is to utilize as much information as possible, both from literature reviews and professional experience, and organize it in the form of a simple but accurate matrix. In order for a functional assessment procedure to be accepted by the regulatory community, the procedure has to be simple enough to use without collecting time-consuming field data and must be able to be completed within a relatively short time period.

It is important to follow the office and field procedures outlined in Section 2.1 when applying WRAP. The testing of the Procedure revealed that the majority of the differences (e.g., identifying surrounding land uses, water quality treatment, etc.) resulted from an inadequate review of the project site prior to the actual field visit. A thorough office evaluation of the project site will help reduce these disparities, as well as reveal any on-going maintenance programs or wildlife studies done for the site or adjacent areas.

Field evaluations are used to verify the information obtained from the office review. Frequently, the field inspections reveal that the water quality treatment component has not been implemented or maintained in accordance with permit design. In these cases, the evaluators must adjust their scores accordingly. It is crucial that the evaluator documents, on the field data sheet, the justification for the revised scores. It is recommended that after conducting a WRAP evaluation, the evaluator keeps the score sheet, with field notes and justification for each variable score, for future reference. Good field notes will also be useful when evaluating the system on a long-term basis.

One of the original goals of testing the design protocol was to evaluate wetland functions impacts associated with specific land uses. Once the testing of WRAP was complete, it became apparent that for most land uses the data set was inadequate to make any inferences in this regard. However, as additional data are collected, further analysis will be conducted in an attempt to establish a relationship between land use and wetland function.

Finally, the testing of WRAP identified nine additional land uses that were not originally identified in the "Design Protocol for WRAP Variable Calibration" (See Section 3.1). Most were multiple land uses with variations of the original ten land uses.

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SPECIES HABITAT REQUIREMENT TABLE

APPENDIX A

<u>SPECIES</u>	<u>FOOD</u>	<u>COVER</u>	<u>REPRODUCTION</u>	<u>HABITAT SIZE</u>
Great Blue Heron (<i>Ardea herodias</i>)	Water is less than 50cm deep, fish, reptiles, and macro-invertebrates.	Not a limiting factor.	Trees 5 - 15 m. Ht. Riparian swamp. Tree islands.	0.4 ha - 4.8 ha.
Bullfrog (<i>Rana catesbeiana</i>)	Fish, reptiles, macro-invertebrates amphibians.	Groundcover, understory, stumps, logs, and banks	Continuous standing water.	Not a limiting factor.
Barred Owl (<i>strix varia</i>)	Small mammals, reptiles, fish, and macro-invertebrates	Dense forested wetlands Deciduous riparian woodlands.	Trees are larger than 50 cm dbh. Nest cavity greater than 7.6 m from ground.	Greater than 10 ha.
Wood Duck (<i>apix sponsa</i>)	Aquatic plants, fruits, insects, acorns and macro-invertebrates.	Downed timber, dense shrub, canopy riparian forest.	50 - 75% cover (tree cavities, shrubs). 25 - 50% open water.	Greater than 4 ha.
Eastern Cottontail (<i>sylvilagus floridanus</i>)	Grasses, herbs, flowers (usually not a limiting factor).	Shrubby cover adjacent to field edges, savanna prairie, forbs, brambles.	Grasses are less than 20 cm high.	Greater than 4 ha.
Alligator (<i>alligator mississippiensis</i>)	Small mammals, large mammals, birds reptiles, fish, & macro-invertebrates.	Palustrine emergent. Estuarine emergent vegetation.	Sloping banks, with available vegetation	Greater than 5 ha.
Sandhill Crane (<i>Grus canadensis</i>)	Insects, macro-invertebrates, reptiles, amphibians, roots, small mammals.	Roosting site typically within large wetlands (cover typically not a limiting factor).	Large marsh complexes. Scattered marshes, bogs (isolation).	Dependent on isolated wetland.
White-tailed deer (<i>Odocoileus virginianus</i>)	Seeds, fruits, twigs, acorns, shoots, buds, broadleaved herbaceous plants, grasses.	Swamps, thickets, broken mixes of forest & agricultural land. Forested area with limited tree canopy.	See cover	Greater than or equal to 40 ha.

<u>SPECIES</u>	<u>FOOD</u>	<u>COVER</u>	<u>REPRODUCTION</u>	<u>HABITAT SIZE</u>
Bobcat (<i>Felis rufus</i>)	Large, medium & small mammals, reptiles, and birds.	Thickets, hollow stumps, logging debris, bottomland hardwood, mixed grassy areas.	Thickets, hollow stumps, logging debris.	Minimum is greater than 1 km. Opt. is greater than 20 km.
Large mouthed bass (<i>Micropterus Salmoides</i>)	Insects, macroinvertebrates, crustaceans, fish and amphibians.	Some standing water at all times. Riverine- sufficient pools of less than 6 cm per second flow.. Lacustrine and lakes with greater than 25% area less than 6 m depth. Optimal cover 40 - 60% of logs, brush, and debris, in littoral areas or pools.	Nesting area: Gravel, vegetation sand, mud, roots, cobble, 0.15 - 7.5 m depth.	No minimum habitat size established.
Belted Kingfisher (<i>Ceryle alcyon</i>)	Fish, crayfish, frogs, & insects.	Roosts on single limbs about 6 - 7 m above ground. Bare branches, wires for fishing.	Shrub cover (brooding), Nesting borrows in steep banks devoid of vegetation	Greater than 1.0 km of lake shore or stream.
Bald Eagle (<i>Haliaeetus leucocephalus</i>)	Birds, medium to small mammals, fish, reptiles & amphibians, macro-invertebrates	Sheltered timber stands.	Old-growth & second-growth timber. Mature trees, open forest structure within 182 m of a lake or fishable body of water.	8 ha of water surrounded by 1.5 km strip of land.
Fox Squirrel (<i>Sciurus niger</i>)	Seeds, mast, buds, insects, tubers, roots, and birds eggs.	Hardwood or pine flatwoods with little understory. Stands of large trees interspersed with agricultural lands, well-drained bottomlands.	Leaf nests, tree cavaties.	2 ha
Gray Squirrel <i>Sciurus carolinensis</i>)	Mast, fruit, buds, seeds, bark, roots, fungus, and animal matter.	Mature hardwood forest with dense well developed understory. Sawtimber si trees greater than 22.8 cm in dbh. trees greater than 22.8 cm in dbh.	Hardwood stands greater than 60 years old, den trees, leaf nests.	Greater than 0.4 ha.

<u>SPECIES</u>	<u>FOOD</u>	<u>COVER</u>	<u>REPRODUCTION</u>	<u>HABITAT SIZE</u>
Redear sunfish (<i>Lepomis microlophus</i>)	Juvenile-algae microcrustaceans, Adults-zooplankton, macro-invertabrates and crustaceans.	Lacustrine, palustrine, slow moving riverine, vegetated shallow areas with brush, stumps and logs.	Depth of water at nest varies 5 cm to 6 m. Vegetative free substrate. Sandy clay, gravel, limestone, shells & mud.	No minimum size established.
Roseate spoonbill (<i>Ajaia ajaia</i>)	Fish, crustaceans, macro-invertebrates	Islands, islets, keys, shrubs and forest wetlands, roosting trees, & shrubs 2 - 6 m up to 30m.	Mangrove thickets, horizontal limbs. (See cover requirements). Nest height 0.5 m - 10 m on islands. 3 - 20 m on mainland.	Colonial birds. Important that the island is greater than 4 km from mainland.
Bluegill (<i>Lepomis macrochirus</i>)	Zooplankton, aquatic and terrestrial insects, and plant material.	Lacustrine, palustrine and slow-moving riverine. Fertile water bodies with submerged vegetation, logs, brush.	Vegetated areas & unvegetated areas. Substrate - fine gravel, sand, sandy - clay, established. mud, limestone shells. 1 - 3 m water depth.	No minimum habitat size
Pine warbler (<i>Dendroica pinus</i>)	Insects, pine seeds, wild fruits, berries.	Pure stands of seral pine trees. 35 - 100 years old, mature conifers.	Horizontal branches in needles at end of a branch or in a clump of cones. Nests at heights greater than 8 m.	Usually greater than 10 ha.
Pileated woodpecker (<i>Dryocopus pileatus</i>)	Ants, beetles, wild fruit.	Foraging: dense canopies with numerous snags, stumps & logs. Cover: dense forests, mesic habitats.	Cavity nesters. Tall snags. Nests at greater than 51 m off ground.	Greater than 130 ha.
Eastern Wild Turkey (<i>Meleagris gallapavo sylvestris</i>)	Grasses, acorns, seeds, fruits, tubers, bulbs, insects, amphibians, crustaceans. insects, amphibians, crustaceans.	Open mature woodlands, mixture of forests and open lands. forests and open lands.	Nests on ground concealed by dense brush, mayfields, fence rows, and utility right-of-ways. brush, mayfields, fence rows, and utility right-of-ways.	Greater than 900 ha.

HABITAT COMMUNITY PROFILES

APPENDIX B

HABITAT	TYPE	WILDLIFE UTILIZATION	OVERSTORY/SHRUB SP	GROUNDCOVER SPP	HYDROLOGY
Everglades		Five Lined Skink (<i>Eumeces inexpectatus</i>)	Slash Pine (<i>Pinus elliotti</i> var. <i>densa</i>)	Sawgrass (<i>Cladium jamaicense</i>)	Inundation 2-6 months
Rocky Glades		Pygmy Rattlesnake (<i>Sistrurus miliarius</i>) Hawk Guild (<i>Buteo spp.</i>) Carolina Wren (<i>Thyothorus ludovicianus</i>) * Pine Warbler (<i>Dendroica pinus</i>) Opposum (<i>Didelphis virginiana</i>) Marsh Rabbit (<i>Sylvilagus palustris</i>) Cotton Rat (<i>Sigmodon spp.</i>) Cotton Mouse (<i>Peromyscus gossypinus</i>) Raccoon (<i>Procyon lotor</i>) * Bobcat (<i>Lynx rufus</i>) * Deer (<i>Odocoileus virginianus</i>)	Cabbage Palm (<i>Sabal palmetto</i>) Gallberry (<i>Ilex galbra</i>) Myrsine (<i>Myrsine spp.</i>) Poisonwood (<i>Metopium toxiferum</i>) Dahoon Holly (<i>Ilex cassine</i>) Saltbush (<i>Baccharis spp.</i>) Carolina willow (<i>Salix caroliniana</i>) Swamp bay (<i>Persea palustris</i>)	Camphor Weed (<i>Pluchea spp.</i>) Snowberry (<i>Chiococca alba</i>) Beak Rush (<i>Rhynchospora spp.</i>) Wire Grass (<i>Aristida spp.</i>) Muhly Grass (<i>Muhlenbergia capillaris</i>) Periphyton (<i>Blue-green algae, etc.</i>) White-top Sedge (<i>Rhynchospora colorata</i>) Mermaid-weed (<i>Proserpinaca spp.</i>) Glades lobelia (<i>Lobelia glandulosa</i>)	

* - See Appendix A

HABITAT	TYPE	WILDLIFE UTILIZATION	OVERSTORY/SHRUB SP	GROUNDCOVER SPP	HYDROLOGY
Everglades		Cricket Frog (<i>Acris gryllus dorsalis</i>)	Slash Pine (<i>Pinus elliottii</i> var. <i>densa</i>)	Sawgrass (<i>Cladium jamaicense</i>)	Inundation > 4 months
Marl Glades		Squirrel treefrog (<i>Hyla squirella</i>)	Cabbage Palm (<i>Sabal palmetto</i>)	Spike Rush (<i>Eleocharis cellulosa</i>)	
		Leopard Frog (<i>Rana sphenoccephala</i>)	Dahoon Holly (<i>Ilex cassine</i>)	Swamp Lily (<i>Crinum americanum</i>)	
		Pig frog (<i>Rana grylio</i>)	Poisonwood (<i>Metopium toxiferum</i>)	Beak Rush (<i>Rhynchospora</i> spp.)	
		Cotton Mouth (<i>Agkistrodon piscivorus</i>)	Pond Cypress (<i>Taxodium ascendens</i>)	Periphyton (Blue-green Algae, etc)	
		Water Snake (<i>Nerodia</i> pp.)		Muhly Grass (<i>Muhlenbergia capillaris</i>)	
		Aquatic Turtle guild		Flat Sedge (<i>Cyperus elegans</i>)	
		* Heron and Egret guild		Flat Sedge (<i>Cyperus haspan</i>)	
		Hawk Guild (<i>Buteo</i> spp.)			
		White Ibis (<i>Guara alba</i>)			
		* Bobcat (<i>Lynx rufus</i>)			
		* Deer (<i>Odocoileus virginianus</i>)			
		Marsh Rabbit (<i>Sylvilagus palustris</i>)			
		Raccoon (<i>Procyon lotor</i>)			

* - See Appendix A

HABITAT TYPE	WILDLIFE UTILIZATION	OVERSTORY/SHRUB SP	GROUNDCOVER SPP	HYDROLOGY
Everglades	Pig frog (<i>Rana grylio</i>)	Cypress (<i>Taxodium spp.</i>)	Sphagnum moss (<i>Sphagnum spp.</i>)	Inundation > 9 months Saturated 12 months/yr
Organic Glades	Cricket Frog (<i>Acris gryllus dorsalis</i>) Little Grass Frog (<i>Limnaoedus ocularis</i>) Aquatic turtle guild * American Alligator (<i>Alligator mississippiensis</i>) Crayfish snake (<i>Regina alleni</i>) * Barred Owl (<i>Strix varia</i>) * Pileated Woodpecker (<i>Hylatomus pileatus</i>) White Ibis (<i>Guara alba</i>) Heron and Egret guild Hawk Guild * Barred Owl (<i>Strix varia</i>) * Pileated Woodpecker (<i>Hylatomus pileatus</i>) River Otter (<i>Lutra canadensis</i>) * Bobcat (<i>Lynx rufus</i>) * Deer (<i>Odocoileus virginianus</i>)	Slash Pine (<i>Pinus elliottii</i> var. <i>densa</i>) Red Bay (<i>Persea palustris</i>) Sweet Bay (<i>Magnolia virginiana</i>) Fetterbush (<i>Lyonia lucida</i>) Buttonbush (<i>Cephalanthus occidentalis</i>) Wax Myrtle (<i>Myrica cerifera</i>)	Pickereel Weed (<i>Pontederia spp.</i>) Duck Potato (<i>Sagittaria spp.</i>) Beak Rush (<i>Rhynchospora spp.</i>) Fragrant Water Lily (<i>Nymphaea odorata</i>) Spike Rush (<i>Eleocharis spp.</i>) Swamp Lily (<i>Crinum americanum</i>) Maidencane (<i>Panicum hemitomom</i>) Sawgrass (<i>Cladium jamaicense</i>)	

* - See Appendix A

HABITAT TYPE	WILDLIFE UTILIZATION	OVERSTORY/SHRUB SP	GROUNDCOVER SPP.	HYDROLOGY
Cypress Swamp	Cricket Frog (<i>Acris gryllus dorsalis</i>) Little Grass Frog (<i>Limnaeodius ocularis</i>) * American Alligator (<i>Alligator mississippiensis</i>) Aquatic Turtle Guild Pig frog (<i>Rana grylio</i>) * Barred Owl (<i>Strix varia</i>) * Heron Guild (<i>Ardea spp., etc.</i>) Limpkin (<i>Aramus guaruana pictus</i>) Great Horned Owl (<i>Bubo virginianus</i>) Woodstork (<i>Mycteria americana</i>) * Wood Duck (<i>Aix sponsa</i>) * Bobcat (<i>Lynx rufus</i>) * Deer (<i>Odocoileus virginianus</i>) River Otter (<i>Lutra canadensis</i>) Raccoon (<i>Procyon lotor</i>)	Bald/Pond Cypress (<i>Taxodium spp.</i>) Coastal Plain Willow (<i>Salix caroliniana</i>) Blackgum (<i>Nyssa sylvatica var. biflora</i>) Red Maple (<i>Acer rubum</i>) Button Bush (<i>Cephalanthus occidentalis</i>) Myrsine (<i>Myrsine guianensis</i>) Virginia-willow (<i>Itea virginica</i>) Wax Myrtle (<i>Myrica cerifera</i>) Fetterbush (<i>Lyonia lucida</i>)	Royal Fern (<i>Osmunda regalis</i>) Cinnamon Fern (<i>Osmunda cinnamomea</i>) Swamp Fern (<i>Blechnum serrulatum</i>) Chain Fern (<i>Woodwardia spp.</i>) Shield Fern (<i>Thelypteris spp.</i>) Arrow Arum (<i>Peltandra virginica</i>) Lizard Tail (<i>Saururus cernuus</i>) Pickerel Weed (<i>Pontederia cordata</i>) Sphagnum Moss (<i>Sphagnum spp.</i>)	Hydroperiod 3-12 months Depth of Inundation +2' (wet) Depth of Inundation -4' (dry)

* - See Appendix A

HABITAT	TYPE	WILDLIFE UTILIZATION	OVERSTORY/SHRUB SP	GROUNDCOVER SPP.	HYDROLOGY
Wet Flatwoods		Oak Toad <i>(Bufo quercicus)</i> Chorus Frog <i>(Pseudacris nigrata)</i> Cricket Frog <i>(Acris gryllus dorsalis)</i> Black Racer <i>(Coluber c. priapus)</i> Diamondback Rattlesnake <i>(Crotalus adamanteus)</i> Pygmy Rattlesnake <i>(Sistrurus millarius)</i> Hawk Guild <i>(Buteo spp.)</i> Bobwhite Quail <i>(Colinus virginianus)</i> Opossum <i>(Didelphis virginiana)</i> Cotton Rat <i>(Sigmodon spp.)</i> Raccoon <i>(Procyon lotor)</i> Striped Skunk <i>(Mephitis mephitis)</i> * Bobcat <i>(Lynx rufus)</i> * Deer <i>(Odocoileus virginianus)</i> * Cottontail Rabbit <i>(Sylvilagus floridanus)</i>	Slash Pine <i>(Pinus elliottii var. densa)</i> Sabal Palm <i>(Sabal palmetto)</i> Dahoon Holly <i>(Ilex cassine)</i> Red Bay <i>(Persea palustris)</i> Wax Myrtle <i>(Myrica cerifera)</i> Saw palmetto <i>(Serenoa repens)</i>	Blue Maidencane <i>(Amphicarpum mulhenbergianum)</i> Wire Grass <i>(Aristida spp.)</i> Beak Rush <i>(Rhynchospora spp.)</i> Maidencane <i>(Panicum hemitomom)</i> Nut Rush <i>(Scleria spp.)</i> Redroot <i>(Lachnanthes caroliniana)</i> Yellow Eyed Grass <i>(Xyris spp.)</i> Pickerel Weed <i>(Pontederia cordata)</i> Colic Root <i>(Aletris lutea)</i> Sundew <i>(Drosera spp.)</i> Milkwort <i>(Polygala spp.)</i> St. Johns Wort <i>(Hypericum spp.)</i> Marsh Pink <i>(Sabatia spp.)</i> Hatpins <i>(Eriocaulon spp.)</i>	Wet Season: Hydroperiod 1-4 months/yr Depth of inundation 1'-2' above the surface Dry Season: Depth of inundation -3' below the surface

HABITAT	TYPE	WILDLIFE UTILIZATION	OVERSTORY/SHRUB SP	GROUNDCOVER SPP	HYDROLOGY
Wet Prairie	#	Leopard Frog (Rana sphenoccephala) Cricket Frog (Acris gryllus dorsalis) Black Racer (Coluber c. priapus) Aquatic Turtle guild Pygmy Rattlesnake (Sistrurus miliarius) Hawk guild Heron and Egret guild White Ibis (Eudocimus albus) Killdeer (Charadrius v. vociferus) Red Winged Blackbird (Agelaius phoeniceus) Marsh Rabbit (Sylvilagus palustris) Cotton Rat (Sigmondon spp.)	* Slash Pine (Pinus elliottii var. densa) * Wax Myrtle (Myrica cerifera) Dahoon Holly (Ilex cassine) * Groundsel bush (Baccharis hamifolia)	Wire Grass (Aristida spp.) Beak Rush (Rhynchospora spp.) Maidencane (Panicum hemitomon) Blatterwort (Utricularia spp.) St. Johns Wort (Hypericum fasciculatum) Marsh Pink (Sabatia spp.) Hatpins (Eriocaulon spp.) Sundew (Drosera capillaris) Yellow Eyed Grass (Xyris spp.) Water Drop-wort (Oxypolis filiformis) Queen's Delight (Stillingia aquatica) Mermaid-weed (Proserpinaca spp.) Giant plumegrass (Erianthus giganteus)	Duration of Inundation +0.7' for 2-5 months/yr.

* - Species will invade during reduced hydroperiods or extended droughts.

-This term is used to describe shallow-depressional wetlands with sandy soils typically found in pine flatwoods communities. Others have used "wet prairie" to describe several different wetland communities in south Florida (e.g., Lodge, 1996).

HABITAT TYPE	WILDLIFE UTILIZATION	OVERSTORY/SHRUB SP	GROUNDCOVER SPP	HYDROLOGY
Emergent Freshwater Marsh & Ponds	Cricket Frog (<i>Acris gryllus dorsalis</i>) Leopard Frog (<i>Rana utricularia</i>) * Bullfrog (<i>Rana catesbeiana</i>) Aquatic Turtle Guild Water Snake (<i>Natrix fasciata</i>) Cottonmouth (<i>Agkistrodon piscivorus</i>) Ribbon Snake (<i>Thamnophis spp.</i>) * American Alligator (<i>Alligator mississippiensis</i>) *Heron and Egret Guild Florida Duck (<i>Anas fulvigula</i>) Snail Kite (<i>Rostrhamus sociabilis</i>) River Otter (<i>Lutra canadensis</i>)	Carolina Willow (<i>Salix caroliniana</i>) Elderberry (<i>Sambucus canadensis</i>) Cypress (<i>Taxodium spp.</i>) Dahoon Holly (<i>Ilex cassine</i>) Blackgum (<i>Nyssa sylvatica var. biflora</i>) Buttonbush (<i>Cephalanthus occidentalis</i>) Pond apple (<i>Annona glabra</i>)	Pickereel Weed (<i>Pontederia spp.</i>) Cattail (<i>Typha spp.</i>) Arrowhead (<i>Sagittaria spp.</i>) Fire-flag (<i>Thalia genticulata</i>) Bulrush (<i>Scirpus spp.</i>) Maidencane (<i>Panicum hemitomon</i>) Ludwigia (<i>Ludwigia spp.</i>) St. Johns Wort (<i>Hypericum spp.</i>) Beak Rush (<i>Rhynchospora spp.</i>) Sawgrass (<i>Cladium jamaicensa</i>) Spike Rush (<i>Eleocharis spp.</i>) Soft Rush (<i>Juncus spp.</i>) Lake Rush (<i>Fuirena spp.</i>) Water Drop Wort (<i>Oxypolis filiformis</i>) Sedges (<i>Cyperus spp.</i>) Smartweed (<i>Polygonum spp.</i>)	Period of Inundation 7-10 months/yr.

* - See Appendix A

HABITAT TYPE	WILDLIFE UTILIZATION	OVERSTORY/SHRUB SP	GROUNDCOVER SPP.	HYDROLOGY
Mixed Hardwood Swamps	Cricket Frog (<i>Acris gryllus dorsalis</i>)	Bald/Pond Cypress (<i>Taxodium spp.</i>)	Royal Fern (<i>Osmunda regalis</i>)	Hydroperiod 4-11 months
	Little Grass Frog (<i>Limnaeodius ocularis</i>)	Pond Apple (<i>Annona glabra</i>)	Cinnamon Fern (<i>Osmunda cinnamomea</i>)	Depth of Inundation +2.5' (wet)
	* American Alligator (<i>Alligator mississippiensis</i>)	Blackgum (<i>Nyssa sylvatica var. biflora</i>)	Swamp Fern (<i>Blechnum serrulatum</i>)	Depth of Inundation -5' (dry)
	Aquatic Turtle Guild	Red Maple (<i>Acer rubrum</i>)	Chain Fern (<i>Woodwardia spp.</i>)	
	Eastern Mud Snake (<i>Farancia abacura</i>)	Button Bush (<i>Cephalanthus occidentalis</i>)	Shield Fern (<i>Thelypteris spp.</i>)	
	Cottonmouth (<i>Agkistrodon piscivorus</i>)	Water Ash (<i>Fraxinus caroliniana</i>)	Arrow Arum (<i>Peltandra virginica</i>)	
	* Barred Owl (<i>Strix varia</i>)	Slash Pine (<i>Pinus elliotii var. densa</i>)	Lizard Tail (<i>Saururus cernuus</i>)	
	Swallow-tailed Kite (<i>Elanoides f. forficatus</i>)	Wax Myrtle (<i>Myrica cerifera</i>)	Pickering Weed (<i>Pontederia spp.</i>)	
	* Pileated Woodpecker (<i>Hylatomus pileatus</i>)	Fetterbush (<i>Lyonia lucida</i>)	Sphagnum Moss (<i>Sphagnum spp.</i>)	
	Great Horned Owl (<i>Bubo virginianus</i>)	Virginia Willow (<i>Itea virginica</i>)	Sawgrass (<i>Cladium jamaicense</i>)	
	Woodstork (<i>Mycteria americana</i>)	Carolina Willow (<i>Salix caroliniana</i>)	Poison Ivy (<i>Toxicodendron radicans</i>)	
	* Wood Duck (<i>Aix sponsa</i>)	American Elm (<i>Ulmus americana</i>)		
	* Deer (<i>Odocoileus virginianus</i>)	Swamp Laurel Oak (<i>Quercus laurifolia</i>)		
	River Otter (<i>Lutra canadensis</i>)	Sweet Bay (<i>Magnolia virginiana</i>)		
	Raccoon (<i>Procyon lotor</i>)	Swamp Bay (<i>Persea palustris</i>)		
	Black Bear (<i>Ursus americanus</i>)			
	* Bobcat (<i>Lynx rufus</i>)			

* - See Appendix A

Appendix C

COMMON FRESH WATER FISHES OF SOUTHERN FLORIDA

List compiled by Dr. Alex Marsh, Department of Biological
Science, Florida Atlantic University, Boca Raton, FL)

Scientific name	Common name
<i>Adinia xenica</i>	Diamond Killifish
<i>Amia calva</i>	Bowfin
<i>Anguilla rostrata</i>	American Eel
<i>Astronotus ocellatus</i> *	Oscar
<i>Belonesox belizanus</i> *	Pike Killifish
<i>Centropomus undecimalis</i> *	Snook
<i>Cichla ocellaris</i> *	Peacock Cichlid
<i>Cichlasoma bimaculatum</i> *	Black Acara
<i>Cichlasoma citronellum</i> *	Midas Cichlid
<i>Cichlasoma octofasciatum</i> *	Jack Dempsey
<i>Cichlasoma urophthalmus</i> *	Mayan Cichlid
<i>Clarias bartachus</i> *	Walking Catfish
<i>Cyprinodon variegatus</i>	Sheepshead Minnow
<i>Diapterus plumieri</i>	Striped Mojarra
<i>Elassoma evergladei</i>	Everglades Pigmy Sunfish
<i>Enneacanthus gloriosus</i>	Bluespotted Sunfish
<i>Erymizon sucetta</i>	Lake Chubsucker
<i>Esox niger</i>	Chain Pickerel
<i>Etheostoma fusiforme</i>	Scalyhead Darter
<i>Fundulus chrysotus</i>	Golden Topminnow
<i>Fundulus confluentus</i>	Marsh Killifish
<i>Fundulus seminolis</i>	Seminole Killifish
<i>Gambusia affinis</i>	Mosquitofish
<i>Hemichromis letourneauxi</i> *	Americal Jewelfish
<i>Heterandria formosa</i>	Least Killifish
<i>Ictalurus natalis</i>	Yellow Bullhead
<i>Jordonella floridae</i>	Flagfish
<i>Labidesthes sicculus</i>	Brook Silverside
<i>Lepisosteus platyrhincus</i>	Florida Gar
<i>Lepomis gulosus</i>	Warmouth
<i>Lepomis macrochirus</i>	Bluegill
<i>Lepomis marginatus</i>	Dollar Sunfish
<i>Lepomis microlophus</i>	Redear Sunfish
<i>Lepomis punctatus</i>	Spotted Sunfish
<i>Lucania goodei</i>	Bluefin Killifish
<i>Micropterus salmoides</i>	Largemouth Bass
<i>Notemigonus crysoleucas</i>	Golden Shiner
<i>Noturus gyrinus</i>	Tadpole Madtom
<i>Poecilia latipinna</i>	Sailfin Molly
<i>Pterygoplichthys multiradiatus</i>	Sailfin Cattfish
<i>Oreochromis mariae</i> *	Blue Tilapia
<i>Oreochromis mossambicus</i> *	Mozambique Tilapia
<i>Tilapia mariae</i> *	Spotted Tilapia

(* Exotic species)

COMMON AQUATIC INSECT TAXA
 (Compiled by Dr. Alex Marsh, Department of Biological
 Sciences, Florida Atlantic University, Boca Raton, FL)

Order	Plecoptera	Stoneflies
Order	Ephemeroptera	Mayflies
Order	Odonata	
	Suborder Anisoptera	Dragonflies
	Suborder Zygoptera	Damselflies
Order	Hemiptera	
	Family Hebridae	Velvet water bugs
	Family Hydrometridae	Water measurers
	Family Mesoveliidae	Water treaders
	Family Gerridae	Water striders
	Family Veliidae	Broad-shouldered water striders
	Family Notonectidae	Backswimmers
	Family Pleidae	Pigmy backswimmers
	Family Naucoridae	Creeping water bugs
	Family Nepidae	Water scorpions
	Family Belostomatidae	Giant water bugs
	Family Corixidae	Water boatmen
Order	Megaloptera	
	Family Sialidae	Alderfly
	Family Corydalidae	Hellgrammite
Order	Neuroptera	Spongilla flies
Order	Trichoptera	Caddis flies
Order	Lepidoptera (Pyrallidae)	Aquatic caterpillars
Order	Coleoptera	
	Family Haliplidae	Crawling water beetles
	Family Dystiscidae	Predaceous diving beetles
	Family Gyrinidae	Whirligig beetles
	Family Hydrophilidae	Water scavengers
	Family Psephenidae	Water pennies
	Family Elmidae	Riffle beetles
	Family Helodidae	Marsh beetles
	Family Noteridae	Burrowing water beetles
	Family Chrysomelidae	Leaf beetles
	Family Dryopidae	Long-toed water beetles
Order	Diptera	
	Family Blepharoceridae	Net-winged midges
	Family Tipulidae	Crane flies
	Family Ptychopteridae	Phantom crane flies
	Family Psychodidae	Moth flies
	Family Dixidae	Dixa midges

Order Diptera (Cont.)

Family Culicidae

Mosquitoes,
phantom midges

Family Simuliidae

Blackflies

Family Tendipedidae

Midges

Family Ceratopogonidae

Biting midges

Family Stratiomyidae

Soldierflies

Family Tabanidae

Horseflies, deerflies

Family Rhagionidae

Snipe flies

Family Syrphidae

Rat-tailed maggots

Family Tetanoceridae

Marsh flies

Family Ephydriidae

Shore flies

Appendix E

SOME COMMON EXOTIC AND NUISANCE PLANT SPECIES
FOUND IN WETLANDS OF SOUTHERN FLORIDA
(Includes Partial List of the Florida Exotic Pest Plant
Council's 1995 Most Invasive Species)

<u>COMMON NAME</u>	<u>SCIENTIFIC NAME</u>	<u>PLANT FORM</u>
alligator weed	<i>Alternanthera philoxeroides</i>	herb
shoebutton ardisia	<i>Ardisia elliptica</i>	shrub, small tree
bishopwood	<i>Bischofia javanica</i>	tree
para grass	<i>Brachiaria mutica</i>	grass
Australian pine	<i>Casuarina equisetifolia</i>	tree
taro	<i>Colocasia esculenta</i>	herb
carrotwood	<i>Cupaniopsis anacardioides</i>	tree
air-potato	<i>Dioscorea bulbiflora</i>	vine
water hyacinth	<i>Eichornia crassipes</i>	herb
Surinam cherry	<i>Eugenia uniflora</i>	shrub, small tree
water primrose	<i>Ludwigia octovalvis</i>	herb
primrose willow	<i>Ludwigia peruviana</i>	herb
Japanese climbing fern	<i>Lygodium japonicum</i>	vine
old world climbing fern	<i>Lygodium microphyllum</i>	vine
climbing hempweed	<i>Mikania scandens</i>	vine
melaleuca	<i>Melaleuca quinquenervia</i>	tree
torpedo grass	<i>Panicum repens</i>	grass
bahia grass	<i>Paspalum notatum</i>	grass
napier grass	<i>Pennisetum purpureum</i>	grass
water lettuce	<i>Pistia stratiotes</i>	herb
guava	<i>Psidium guajava</i>	tree
Chinese tallow	<i>Sapium sebiferum</i>	small tree
Brazilian pepper	<i>Schinus terebinthifolius</i>	tree
St. Augustine grass	<i>Stenotaphrum secundatum</i>	grass
Java plum	<i>Syzygium cumini</i>	tree
seaside mahoe	<i>Thespesia populnea</i>	tree
cattail	<i>Typha</i> spp.	herb
Caesar's weed	<i>Urena lobata</i>	herb
wedelia	<i>Wedelia trilobata</i>	herb

Appendix F

WRAP Dataset

PERMIT NO.	PROJECT	DATE	EVALUATOR	WETLAND TYPE	LANDUSE	WU	O/S	GC	BUFF	E&N	HYD	WQ	WRAP	SITE	OBS
4390018	WEST JENSEN	06/11/96	BG	WP/24	UNDEV	2.50	N/A	2.00	3.00	2.00	3.00	3.00	0.86	1	1
4390018	WEST JENSEN	06/11/96	BN	WP/24	UNDEV	3.00	N/A	2.50	2.50	2.00	3.00	3.00	0.89	1	2
4390018	WEST JENSEN	06/11/96	RM	WP/24	UNDEV	2.50	N/A	2.00	3.00	2.00	3.00	3.00	0.86	1	3
4300672	HIDDEN OAKS	06/11/96	BG	HM/CREATED	INSTIT.	2.00	N/A	1.50	1.50	1.00	2.00	1.60	0.53	2	1
4300672	HIDDEN OAKS	06/11/96	BN	HM/CREATED	INSTIT.	1.00	N/A	1.50	1.50	2.00	2.00	1.70	0.54	2	2
4300672	HIDDEN OAKS	06/11/96	RM	HM/CREATED	INSTIT.	1.50	N/A	1.50	1.00	1.50	2.00	1.70	0.51	2	3
4300196	HIGH MEADOWS	06/01/96	RM	MM/CREATED	HIGHWAY	1.50	2.00	2.00	1.00	2.50	2.00	1.00	0.57	3	1
4300196	HIGH MEADOWS	06/01/96	BN	MM/CREATED	HIGHWAY	1.50	2.00	2.50	1.00	2.50	2.00	1.00	0.59	3	2
4300196	HIGH MEADOWS	06/01/96	BG	MM/CREATED	HIGHWAY	1.50	1.00	2.50	0.50	3.00	3.00	1.00	0.59	3	3
N/A	DWP-STUMP	07/23/96	LMG	HM	AG/PASTURE	1.50	N/A	1.50	2.00	2.00	2.50	2.00	0.64	4	1
N/A	DWP-STUMP	07/23/96	BG	HM	AG/PASTURE	2.00	N/A	1.50	2.00	1.50	2.00	1.50	0.58	4	2
N/A	LLK2-TCP	07/25/96	BG	WP	UNDEV/CITRUS	2.50	N/A	2.00	2.50	3.00	3.00	3.00	0.89	5	1
N/A	LLK2-TCP	07/25/96	LMG	WP	UNDEV/CITRUS	3.00	N/A	2.50	3.00	3.00	3.00	2.80	0.96	5	2
MIT.BANK	LLGSMB	07/24/96	LMG	MH	AG/CITRUS	2.50	3.00	3.00	2.00	3.00	3.00	1.00	0.83	6	1
MIT.BANK	LLGSMB	07/24/96	BG	MH	AG/CITRUS	2.00	3.00	3.00	2.00	3.00	2.50	1.50	0.81	6	2
50-	FOREST HILL NRS	11/25/96	RM	MM	AG/ROW	1.50	1.50	2.00	1.00	2.00	2.00	1.75	0.56	7	1
50-	FOREST HILL NRS	11/25/96	BR	MM	AG/ROW	1.50	2.00	2.00	1.00	2.00	2.00	1.75	0.58	7	2
50-	FOREST HILL NRS	11/25/96	BG	MM	AG/ROW	1.50	1.50	2.00	1.00	2.00	2.00	1.75	0.56	7	3
5001161	PB PK OF COMM	11/25/96	RM	EM	IND	2.00	N/A	2.00	1.50	2.00	2.00	1.75	0.62	8	1
5001161	PB PK OF COMM	11/25/96	BR	EM	IND	2.50	N/A	2.00	2.00	2.00	2.00	1.75	0.68	8	2
5001161	PB PK OF COMM	11/25/96	BG	EM	IND	2.00	N/A	1.50	2.00	2.00	2.00	1.75	0.63	8	3
5000618	SARATOGA/WLB	11/25/96	RM	WP	SF/RES	2.00	N/A	2.00	1.00	2.00	2.00	2.80	0.66	9	1
5000618	SARATOGA/WLB	11/25/96	BR	WP	SF/RES	1.50	N/A	2.00	2.00	2.00	2.00	2.80	0.68	9	2
5000618	SARATOGA/WLB	11/25/96	BG	WP	SF/RES	1.50	N/A	2.00	1.00	2.50	2.00	2.80	0.66	9	3
5000618	SARATOGA/115AC	11/25/96	RM	MM	SF/RES	2.00	2.00	2.50	2.50	1.50	2.50	2.80	0.75	10	1
5000618	SARATOGA/115AC	11/25/96	BR	MM	SF/RES	2.50	1.50	2.00	2.50	1.00	2.00	2.80	0.68	10	2
5000618	SARATOGA/115AC	11/25/96	BG	MM	SF/RES	2.00	2.00	2.50	2.00	1.50	2.50	2.80	0.73	10	3
5001161	PK OF COMM/C8	11/25/96	RM	EM	IND	2.00	N/A	2.50	3.00	2.50	2.50	3.00	0.86	11	1
5001161	PK OF COMM/C8	11/25/96	BR	EM	IND	2.00	N/A	2.00	2.50	2.50	2.50	3.00	0.81	11	2
5001161	PK OF COMM/C8	11/25/96	BG	EM	IND	2.00	N/A	2.00	3.00	2.50	3.00	3.00	0.86	11	3
5600573	LK. HEATHERWD	11/22/96	RM	EM	SF/RES	1.50	N/A	1.50	0.50	1.50	2.00	2.00	0.50	12	1
5600573	LK. HEATHERWD	11/22/96	BR	EM	SF/RES	2.00	N/A	1.50	0.50	1.00	2.00	2.00	0.50	12	2
5600573	LK. HEATHERWD	11/22/96	BG	EM	SF/RES	1.00	N/A	1.50	0.50	1.00	2.50	2.00	0.47	12	3
5600573	LK. HEATHERWD	11/22/96	BN	EM	SF/RES	1.00	N/A	1.50	0.50	1.00	2.00	2.00	0.45	12	4
	W. JENSEN/WL24	11/22/96	BG	WP	SF/RES/GC	2.00	N/A	2.50	1.00	2.50	2.50	2.50	0.72	13	1
	W. JENSEN/WL24	11/22/96	BN	WP	SF/RES/GC	2.50	N/A	2.50	2.00	2.50	2.50	2.50	0.81	13	2
	W. JENSEN/WL24	11/22/96	BR	WP	SF/RES/GC	2.00	N/A	2.50	2.00	2.50	2.00	2.50	0.75	13	3
	W. JENSEN/WL24	11/22/96	RM	WP	SF/RES/GC	2.50	N/A	2.00	1.50	2.00	2.50	2.50	0.72	13	4
5600573	SCHOOL CCC	11/22/96	RM	EM/CREATED	INST.	2.00	N/A	2.50	0.50	2.00	2.00	0.50	0.53	14	1
5600573	SCHOOL CCC	11/22/96	BR	EM/CREATED	INST.	2.50	N/A	2.00	1.00	2.00	2.00	0.50	0.56	14	2
5600573	SCHOOL CCC	11/22/96	BG	EM/CREATED	INST.	1.50	N/A	2.50	1.00	2.50	2.50	0.50	0.58	14	3
5600573	SCHOOL CCC	11/22/96	BN	EM/CREATED	INST.	1.50	N/A	2.00	1.00	2.00	2.50	0.50	0.53	14	4
4300196	HIGH MED. AVE	11/22/96	RM	FORESTED/PRES	HWY	2.00	2.00	2.00	0.50	2.50	2.00	1.50	0.59	15	1
4300196	HIGH MED. AVE	11/22/96	BR	FORESTED/PRES	HWY	1.00	1.00	2.00	1.00	2.50	2.00	1.50	0.52	15	2
4300196	HIGH MED. AVE	11/22/96	BG	FORESTED/PRES	HWY	1.00	1.00	2.00	0.50	2.50	2.50	1.50	0.52	15	3
4300196	HIGH MED. AVE	11/22/96	BN	FORESTED/PRES	HWY	1.50	1.50	2.00	1.00	2.00	2.00	1.50	0.55	15	4
4300196	HIGH MED. AVE	11/22/96	BR	MM/CREATED	HWY	2.50	2.50	3.00	1.00	3.00	2.00	1.50	0.73	16	1
4300196	HIGH MED. AVE	11/22/96	RM	MM/CREATED	HWY	1.50	1.50	2.50	1.00	2.50	2.50	1.50	0.62	16	2
4300196	HIGH MED. AVE	11/22/96	BG	MM/CREATED	HWY	1.50	2.00	3.00	0.50	3.00	2.50	1.50	0.66	16	3
4300196	HIGH MED. AVE	11/22/96	BN	MM/CREATED	HWY	1.50	2.00	2.50	1.00	2.50	2.00	1.50	0.62	16	4
	HIDDEN OAKS	11/22/96	RM	EM/CREATED	INST	2.00	N/A	1.50	1.50	2.00	2.00	1.95	0.61	17	1
	HIDDEN OAKS	11/22/96	BN	EM/CREATED	INST	1.50	N/A	2.00	1.50	2.00	2.00	1.95	0.61	17	2
	HIDDEN OAKS	11/22/96	BR	EM/CREATED	INST	2.50	N/A	2.00	1.50	2.00	2.00	1.95	0.66	17	3
	HIDDEN OAKS	11/22/96	BG	EM/CREATED	INST	1.50	N/A	2.00	1.00	2.00	2.50	1.95	0.61	17	4

PERMIT NO.	PROJECT	DATE	EVALUATOR	WETLAND TYPE	LANDUSE	WU	O/S	GC	BUFF	E&N	HYD	WQ	WRAP	SITE	OBS
	E. ORG. CO.	12/10/96	LM	FORESTED	WASTEWATER	2.50	1.50	1.50	2.50	1.00	1.50	0.75	0.54	18	1
	E. ORG. CO.	12/10/96	LG	FORESTED	WASTEWATER	3.00	1.50	1.50	3.00	1.00	1.50	0.75	0.63	18	2
	E. ORG. CO.	12/10/96	BG	FORESTED	WASTEWATER	2.50	1.00	1.00	3.00	1.50	1.00	0.75	0.51	18	3
	MEAD GARDENS	12/10/96	BG	FORESTED/BAY	REC	1.50	1.00	1.50	1.50	1.00	2.50	0.69	0.46	19	1
	MEAD GARDENS	12/10/96	LG	FORESTED/BAY	REC	2.00	1.50	1.00	1.50	1.00	2.50	0.69	0.44	19	2
	MEAD GARDENS	12/10/96	LM	FORESTED/BAY	REC	2.00	2.00	1.00	1.50	0.00	2.50	0.69	0.47	19	3
	LK. ADAIR/DITCH	12/10/96	BG	CHNNL STREAM	SF/HWY	1.00	N/A	1.00	0.50	2.00	2.00	0.63	0.40	20	1
	LK. ADAIR/DITCH	12/10/96	LG	CHNNL STREAM	SF/HWY	0.50	N/A	0.50	1.50	2.00	2.00	0.63	0.40	20	2
	LK. ADAIR/DITCH	12/10/96	LM	CHNNL STREAM	SF/HWY	0.50	N/A	0.50	1.00	2.00	2.00	0.63	0.37	20	3
	LK. ADAIR	12/10/96	BG	LAKE	SF/HWY	1.00	2.00	1.50	0.50	2.00	2.00	0.63	0.48	21	1
	LK. ADAIR	12/10/96	LM	LAKE	SF/HWY	2.00	2.00	0.50	1.00	2.00	2.00	0.63	0.48	21	2
	LK. ADAIR	12/10/96	LG	LAKE	SF/HWY	2.00	1.50	0.50	0.50	2.50	2.50	0.63	0.48	21	3
	E. ORG. CO.	12/10/96	BG	EM	WASTE WATER	2.50	N/A	1.00	2.50	1.00	1.50	0.75	0.51	22	1
	E. ORG. CO.	12/10/96	LG	EM	WASTE WATER	2.50	N/A	1.00	3.00	0.50	2.00	0.75	0.54	22	2
	E. ORG. CO.	12/10/96	LM	EM	WASTE WATER	2.00	N/A	1.00	2.00	0.50	2.00	0.75	0.46	22	3
	E. ORG. CO.	12/10/96	LM	MH/CONTROL	WASTE WATER	2.50	2.50	3.00	3.00	3.00	2.50	3.00	0.93	23	1
	E. ORG. CO.	12/10/96	BG	MH/CONTROL	WASTE WATER	2.50	2.50	3.00	3.00	3.00	2.50	3.00	0.93	23	2
	E. ORG. CO.	12/10/96	LG	MH/CONTROL	WASTE WATER	3.00	3.00	3.00	3.00	2.50	3.00	3.00	0.98	23	3
	E.W. EXPWY	12/10/96	LM	MM/RESTOR.	HWY	1.50	1.50	2.50	1.50	2.50	1.50	2.38	0.64	24	1
	E.W. EXPWY	12/10/96	LG	MM/RESTOR.	HWY	1.00	1.00	2.00	1.00	3.00	1.50	2.38	0.57	24	2
	E.W. EXPWY	12/10/96	BG	MM/RESTOR.	HWY	1.50	1.00	2.50	1.50	2.50	2.00	2.38	0.64	24	3
	E.W EXP/ROUSE	12/10/96	LM	CYP	HWY	1.00	3.00	3.00	0.50	3.00	2.50	1.30	0.68	25	1
	E.W EXP/ROUSE	12/10/96	LG	CYP	HWY	1.50	3.00	3.00	1.00	3.00	2.00	1.30	0.70	25	2
	E.W EXP/ROUSE	12/10/96	BG	CYP	HWY	1.00	2.00	2.00	1.00	2.50	2.00	1.30	0.56	25	3
	CNTRY CRK J&K	12/11/96	LM	RIP/FOREST	REC	2.50	2.50	1.50	2.50	2.00	3.00	2.25	0.73	26	1
	CNTRY CRK J&K	12/11/96	CG	RIP/FOREST	REC	2.00	2.50	1.50	2.50	2.00	3.00	2.25	0.75	26	2
	CNTRY CRK J&K	12/11/96	LG	RIP/FOREST	REC	2.50	2.50	1.50	2.50	2.00	3.00	2.25	0.73	26	3
	CNTRY CRK J&K	12/11/96	BG	RIP/FOREST	REC	2.50	2.50	1.50	2.50	2.00	3.00	2.25	0.77	26	4
	LK. LOTUS	12/11/96	BG	MH	RES	2.50	3.00	3.00	3.00	2.50	3.00	2.50	0.93	27	1
	LK. LOTUS	12/11/96	LM	MH	RES	2.50	3.00	3.00	3.00	3.00	3.00	2.50	0.95	27	2
	LK. LOTUS	12/11/96	CG	MH	RES	2.70	3.00	2.70	2.70	2.70	3.00	2.50	0.92	27	3
	LK LOTUS	12/11/96	LG	MH	RES	3.00	3.00	3.00	2.50	3.00	3.00	2.50	0.95	27	4
	LK. COMO	12/11/96	CG	EM	RES/SF	2.00	N/A	1.50	1.00	1.50	2.00	1.69	0.54	28	1
	LK. COMO	12/11/96	LM	EM	RES/SF	2.00	N/A	1.50	1.00	2.00	2.00	1.69	0.57	28	2
	LK. COMO	12/11/96	LG	EM	RES/SF	2.00	N/A	1.50	1.50	1.00	2.50	1.69	0.57	28	3
	LK. COMO	12/11/96	BG	EM	RES/SF	2.00	N/A	1.50	1.00	1.00	3.00	1.69	0.57	28	4
	CHASE GROVE	12/11/96	BG	MH	RES/MF	1.00	3.00	2.50	1.50	2.50	2.50	2.13	0.72	29	1
	CHASE GROVE	12/11/96	LM	MH	RES/MF	1.50	3.00	2.50	2.00	2.50	3.00	2.13	0.79	29	2
	CHASE GROVE	12/11/96	CG	MH	RES/MF	1.50	3.00	2.00	1.00	3.00	3.00	2.13	0.73	29	3
	CHASE GROVE	12/11/96	LG	MH	RES/MF	1.00	3.00	2.50	1.50	2.00	2.00	2.13	0.67	29	4
	ALHAMBRA	12/19/96	BR	EM	RES/SF	0.50	N/A	1.00	0.00	2.00	1.50	1.25	0.35	30	1
	ALHAMBRA	12/19/96	GS	EM	RES/SF	0.50	N/A	1.00	0.00	3.00	2.00	1.25	0.43	30	2
	ALHAMBRA	12/19/96	RM	EM	RES/SF	0.50	N/A	1.00	0.00	2.50	2.00	1.25	0.40	30	3
	ALHAMBRA	12/19/96	DB	EM	RES/SF	0.50	N/A	0.50	0.50	1.50	2.00	1.25	0.34	30	4
	ALHAMBRA	12/19/96	BG	EM	RES/SF	0.50	N/A	1.00	0.50	2.00	2.00	1.25	0.40	30	5
0601978	ESTANCIA/ENTR	12/19/96	BR	MM	RES/SF	1.00	1.00	2.00	0.50	2.00	2.00	2.00	0.50	31	1
0601978	ESTANCIA/ENTR	12/19/96	BG	MM	RES/SF	1.00	1.00	2.00	0.50	2.00	2.00	2.00	0.50	31	2
0601978	ESTANCIA/ENTR	12/19/96	RM	MM	RES/SF	1.00	1.50	2.00	1.00	2.00	1.50	2.00	0.52	31	3
0601978	ESTANCIA/ENTR	12/19/96	DB	MM	RES/SF	1.00	1.00	2.00	1.00	2.00	2.50	2.00	0.54	31	4
0601978	ESTANCIA/ENTR	12/19/96	GS	MM	RES/SF	1.00	1.00	2.00	1.00	2.50	1.50	2.00	0.52	31	5
0601978	ESTANCIA/PRES.	12/19/96	RM	MM	RES/SF	2.00	1.00	2.00	0.50	1.50	2.00	2.00	0.52	32	1
0601978	ESTANCIA/PRES.	12/19/96	BG	MM	RES/SF	1.50	0.50	1.50	0.50	1.50	2.00	2.00	0.45	32	2
0601978	ESTANCIA/PRES.	12/19/96	DB	MM	RES/SF	1.50	1.50	1.50	1.50	2.00	2.00	2.00	0.57	32	3
0601978	ESTANCIA/PRES.	12/19/96	GS	MM	RES/SF	1.50	1.00	2.00	1.00	2.00	2.00	2.00	0.55	32	4
0601978	ESTANCIA/PRES.	12/19/96	BR	MM	RES/SF	2.00	1.50	1.50	0.50	1.50	1.50	2.00	0.50	32	5

PERMIT NO.	PROJECT	DATE	EVALUATOR	WETLAND TYPE	LANDUSE	WU	O/S	GC	BUFF	E&N	HYD	WQ	WRAP	SITE	OBS
0601401	WALDEN LK. W.	12/19/98	BR	EM	RES/SF	1.50	N/A	2.00	0.50	2.00	2.00	2.00	0.58	33	1
0601401	WALDEN LK. W.	12/19/98	DB	EM	RES/SF	1.50	N/A	1.50	0.50	2.00	2.00	2.00	0.53	33	2
0601401	WALDEN LK. W.	12/19/98	GS	EM	RES/SF	1.50	N/A	2.00	0.00	3.00	2.50	2.00	0.61	33	3
0601401	WALDEN LK. W.	12/19/98	BG	EM	RES/SF	1.00	N/A	2.00	0.00	2.50	2.00	2.00	0.52	33	4
0601401	WALDEN LK. W.	12/19/98	RM	EM	RES/SF	1.00	N/A	2.00	0.00	2.50	2.00	2.00	0.53	33	5
3600258	McMGR BAPT, CH.	11/12/96	KF	MM	INST	2.50	2.00	3.00	2.50	2.50	3.00	2.94	0.88	34	1
3600258	McMGR BAPT, CH.	11/12/96	SB (COE)	MM	INST	2.00	2.00	2.50	2.00	2.00	3.00	2.94	0.78	34	2
3600258	McMGR BAPT, CH.	11/12/96	DD	MM	INST	2.00	2.00	2.50	2.50	2.00	3.00	2.94	0.81	34	3
3602271	N. RIVER EST.	11/07/96	KF	EM	RES/LD	2.50	N/A	3.00	3.00	3.00	3.00	2.30	0.93	35	1
3602271	N. RIVER EST.	11/07/96	HH	EM	RES/LD	3.00	N/A	2.50	3.00	3.00	2.50	2.30	0.90	35	2
3602271	N. RIVER EST.	11/07/96	JM	EM	RES/LD	3.00	N/A	2.50	2.50	3.00	3.00	2.30	0.90	35	3
3602271	N. RIVER EST.	11/07/96	SD	EM	RES/LD	3.00	N/A	3.00	2.00	3.00	3.00	2.30	0.90	35	4
1100737	COLLIERS PRES.	10/24/96	KF	HP	RES/SF	3.00	3.00	2.50	2.00	2.50	2.50	2.33	0.85	36	1
1100737	COLLIERS PRES.	10/24/96	DM	HP	RES/SF	2.00	2.50	2.50	2.00	2.50	2.00	2.33	0.75	36	2
1100737	COLLIERS PRES.	10/24/96	HH	HP	RES/SF	2.50	2.50	2.00	2.00	2.50	2.00	2.33	0.78	36	3
1100737	COLLIERS PRES.	10/24/96	JM	HP	RES/SF	2.50	3.00	2.00	2.00	2.50	2.50	2.33	0.80	36	4
3602618	DEL PRADO BLVD	09/26/96	DD	EM	HWY	2.50	N/A	3.00	2.50	2.50	3.00	3.00	0.92	37	1
3602618	DEL PRADO BLVD	09/26/96	SD	EM	HWY	3.00	N/A	2.50	3.00	2.50	3.00	3.00	0.94	37	2
3602618	DEL PRADO BLVD	09/26/96	KF	EM	HWY	3.00	N/A	2.50	2.50	2.50	3.00	3.00	0.92	37	3
3602618	DEL PRADO BLVD	09/26/96	HH	EM	HWY	3.00	N/A	3.00	2.50	2.50	3.00	3.00	0.94	37	4
3600853	J. JASSEY VEG.	11/21/96	HH	CYP/MIT	AG/ROW	1.50	0.50	1.50	2.00	1.00	2.00	1.38	0.47	38	1
3600853	J. JASSEY VEG.	11/21/96	SD	CYP/MIT	AG/ROW	1.50	0.50	1.50	2.00	1.00	3.00	1.38	0.52	38	2
3600853	J. JASSEY VEG.	11/21/96	KF	CYP/MIT	AG/ROW	2.00	0.50	2.00	2.00	1.00	3.00	1.38	0.57	38	3
3600853	J. JASSEY VEG.	11/21/96	DM	CYP/MIT	AG/ROW	1.50	0.50	2.00	2.00	1.00	2.50	1.38	0.52	38	4
3602411	SIX MILE OMNI	11/21/96	DM	CYP	AG/FALLOW	2.00	2.00	2.00	1.00	2.50	2.00	0.50	0.57	39	1
3602411	SIX MILE OMNI	11/21/96	SD	CYP	AG/FALLOW	2.00	2.00	2.00	1.00	2.00	3.00	0.50	0.60	39	2
3602411	SIX MILE OMNI	11/21/96	HH	CYP	AG/FALLOW	2.00	2.00	2.00	2.00	2.00	2.00	0.50	0.55	39	3
3602411	SIX MILE OMNI	11/21/96	KF	CYP	AG/FALLOW	2.00	2.50	2.50	0.50	2.00	3.00	0.50	0.62	39	4
3601077	OLDE HICKORY	11/21/96	SD	WP	RES/MF	2.00	N/A	3.00	1.00	2.50	2.00	2.25	0.71	40	1
3601077	OLDE HICKORY	11/21/96	DM	WP	RES/MF	1.50	N/A	1.50	1.00	2.50	2.50	2.25	0.63	40	2
3601077	OLDE HICKORY	11/21/96	HH	WP	RES/MF	1.50	N/A	2.00	1.50	2.50	2.50	2.25	0.68	40	3
3601077	OLDE HICKORY	11/21/96	KF	WP	RES/MF	1.50	N/A	2.50	1.00	2.50	2.50	2.25	0.68	40	4
3601223	COLONIAL BLVD	11/21/96	KF	CYP/MIT	HWY	2.00	0.50	2.00	2.50	1.50	3.00	3.00	0.69	41	1
3601223	COLONIAL BLVD	11/21/96	HH	CYP/MIT	HWY	2.50	1.00	1.50	2.50	2.00	2.00	3.00	0.69	41	2
3601223	COLONIAL BLVD	11/21/96	SD	CYP/MIT	HWY	2.00	0.50	1.50	2.50	1.00	3.00	3.00	0.64	41	3
3601223	COLONIAL BLVD	11/21/96	DM	CYP/MIT	HWY	2.00	1.00	2.00	2.50	1.00	3.00	3.00	0.69	41	4
3601634	R. POWELL AG	10/10/96	KF	CYP/MIT	AG	2.00	0.50	2.50	3.00	2.00	1.50	2.75	0.68	42	1
3601634	R. POWELL AG	10/10/96	HH	CYP/MIT	AG	1.50	1.00	2.00	2.00	1.00	2.00	2.75	0.58	42	2
3601634	R. POWELL AG	10/10/96	SD	CYP/MIT	AG	2.00	1.50	1.50	2.50	2.00	2.50	2.75	0.70	42	3
3601634	R. POWELL AG	10/10/96	DD	CYP/MIT	AG	1.50	0.50	2.50	3.00	1.50	1.50	2.75	0.63	42	4
3601267	AIRSIDE PLAZA	10/10/96	KF	MM/MIT	LICOMM	2.50	2.00	2.50	2.00	2.00	2.00	2.38	0.73	43	1
3601267	AIRSIDE PLAZA	10/10/96	SD	MM/MIT	LICOMM	1.50	1.50	2.50	3.00	2.00	3.00	2.38	0.70	43	2
3601267	AIRSIDE PLAZA	10/10/96	HH	MM/MIT	LICOMM	2.50	2.00	2.50	2.00	2.00	1.50	2.38	0.71	43	3
3601267	AIRSIDE PLAZA	10/10/96	DD	MM/MIT	LICOMM	2.00	1.50	2.50	2.50	2.50	3.00	2.40	0.78	43	4
3601396	HERONS GLEN	09/26/96	KF	WP	RES/SF	2.50	N/A	2.50	2.00	1.00	2.50	2.80	0.74	44	1
3601396	HERONS GLEN	09/26/96	HH	WP	RES/SF	2.00	N/A	2.50	2.00	2.00	2.50	2.80	0.77	44	2
3601396	HERONS GLEN	09/26/96	SD	WP	RES/SF	2.00	N/A	3.00	2.00	2.00	3.00	2.80	0.74	44	3
3601396	HERONS GLEN	09/26/96	DD	WP	RES/SF	2.50	N/A	2.50	2.00	1.50	3.00	2.80	0.80	44	4
3602926	SHELL PIT INC.	09/26/96	KF	WP	IND	1.50	N/A	2.50	2.50	1.50	2.50	3.00	0.75	45	1
3602926	SHELL PIT INC.	09/26/96	HH	WP	IND	2.00	N/A	2.50	2.50	2.00	2.50	3.00	0.81	45	2
3602926	SHELL PIT INC.	09/26/96	DD	WP	IND	1.50	N/A	2.50	2.50	1.50	3.00	3.00	0.78	45	3
3602926	SHELL PIT INC.	09/26/96	SD	WP	IND	1.50	N/A	3.00	3.00	1.00	3.00	3.00	0.81	45	4
3601396	HERONS GLEN	09/26/96	KF	EM	RES/SF/GC	2.50	2.00	2.50	0.50	1.50	2.00	1.13	0.58	46	1
3601396	HERONS GLEN	09/26/96	SD	EM	RES/SF/GC	3.00	2.00	2.00	0.50	1.00	1.00	1.13	0.51	46	2
3601396	HERONS GLEN	09/26/96	DD	EM	RES/SF/GC	2.00	1.50	2.00	0.50	1.50	2.00	1.13	0.51	46	3
3601396	HERONS GLEN	09/26/96	HH	EM	RES/SF/GC	2.50	2.00	2.00	0.50	1.00	2.00	1.13	0.59	46	4

PERMIT NO.	PROJECT	DATE	EVALUATOR	WETLAND TYPE	LANDUSE	WU	O/S	GC	BUFF	E&N	HYD	WQ	WRAP	SITE	OBS
3602736	WALMART	11/07/96	SD	EM	HICOMM	2.00	1.50	2.00	1.50	1.50	2.00	1.70	0.58	47	1
3602736	WALMART	11/07/96	HH	EM	HICOMM	1.00	1.50	2.50	1.50	1.50	2.00	1.70	0.56	47	2
3602736	WALMART	11/07/96	KF	EM	HICOMM	1.50	2.00	2.50	1.50	2.50	2.00	1.70	0.65	47	3
3602736	WALMART	11/07/96	JM	EM	HICOMM	1.50	1.50	2.50	1.00	2.50	1.50	1.70	0.58	47	4
	ENERGY RECOVR	11/07/96	KF	MH/MIT	IND	2.00	0.00	2.00	2.50	2.50	1.50	2.10	0.60	48	1
	ENERGY RECOVR	11/07/96	JM	MH/MIT	IND	2.50	0.50	2.50	2.50	2.50	1.50	2.10	0.67	48	2
	ENERGY RECOVR	11/07/96	HH	MH/MIT	IND	2.50	0.50	2.00	3.00	2.00	2.00	2.60	0.70	48	3
	ENERGY RECOVR	11/07/96	SD	MH/MIT	IND	2.00	0.00	3.00	2.00	2.00	3.00	2.60	0.70	48	4
1101367	TURTLE CREEK	10/24/96	KF	HP	RES/MF	2.50	2.50	2.50	3.00	2.50	2.50	2.75	0.87	49	1
1101367	TURTLE CREEK	10/24/96	DM	HP	RES/MF	2.50	3.00	3.00	3.00	2.50	2.50	2.75	0.92	49	2
1101367	TURTLE CREEK	10/24/96	HH	HP	RES/MF	2.50	2.50	2.50	2.50	2.50	2.50	2.75	0.85	49	3
1101367	TURTLE CREEK	10/24/96	JM	HP	RES/MF	2.50	3.00	3.00	2.50	2.50	2.50	2.75	0.89	49	4
1100900	RAILHD. IND. PK.	10/24/96	KF	WP	IND	2.00	N/A	3.00	2.50	2.50	3.00	2.70	0.87	50	1
1100900	RAILHD. IND. PK.	10/24/96	DM	WP	IND	2.00	N/A	2.50	2.50	2.50	2.50	2.70	0.82	50	2
1100900	RAILHD. IND. PK.	10/24/96	HH	WP	IND	2.00	N/A	2.50	2.50	2.50	3.00	2.70	0.84	50	3
1100900	RAILHD. IND. PK.	10/24/96	JM	WP	IND	2.00	N/A	2.50	2.50	2.50	2.50	2.70	0.82	50	4
1100556	951 COMM. CTR.	10/03/96	KF	WP	LICOMM	2.50	N/A	2.50	2.00	0.50	2.50	2.25	0.74	51	1
1100556	951 COMM. CTR.	10/03/96	JM	WP	LICOMM	1.50	N/A	2.00	1.50	1.50	2.50	2.25	0.63	51	2
1100556	951 COMM. CTR.	10/03/96	HH	WP	LICOMM	1.50	N/A	2.00	1.50	2.50	2.00	2.25	0.65	51	3
1100556	951 COMM. CTR.	10/03/96	DD	WP	LICOMM	2.00	N/A	2.50	1.50	1.50	2.50	2.38	0.69	51	4
9604125	HERON PK. APTS.	10/03/96	JM	CYP/PN	RES/MF	0.50	1.00	0.50	1.50	1.00	2.00	1.94	0.40	52	1
9604125	HERON PK. APTS.	10/03/96	HH	CYP/PN	RES/MF	1.50	1.50	1.50	2.00	1.00	1.50	2.00	0.53	52	2
9604125	HERON PK. APTS.	10/03/96	KF	CYP/PN	RES/MF	1.50	0.50	0.50	1.50	1.00	1.50	1.94	0.40	52	3
9604125	HERON PK. APTS.	10/03/96	DD	CYP/PN	RES/MF	0.50	1.00	0.50	1.50	1.00	2.50	1.94	0.43	52	4
3600142	LEHIGH ACRES	11/07/96	HH	EM	HICOMM	2.50	2.00	3.00	2.50	3.00	3.00	2.50	0.88	53	1
3600142	LEHIGH ACRES	11/07/96	JM	EM	HICOMM	2.50	2.00	3.00	2.50	3.00	3.00	2.50	0.88	53	2
3600142	LEHIGH ACRES	11/07/96	SD	EM	HICOMM	2.00	2.00	3.00	2.00	2.00	3.00	2.50	0.79	53	3
3600142	LEHIGH ACRES	11/07/96	KF	EM	HICOMM	2.00	2.50	3.00	2.50	3.00	3.00	2.50	0.88	53	4
9608123	THE CLUB EST.	10/03/96	KF	CYP/PN	RES/SF/UNDEV	1.50	2.00	2.00	2.00	0.50	2.00	2.63	0.60	54	1
9608123	THE CLUB EST.	10/03/96	DD	CYP/PN	RES/SF/UNDEV	1.50	2.00	2.50	2.50	1.00	2.00	2.63	0.67	54	2
9608123	THE CLUB EST.	10/03/96	JM	CYP/PN	RES/SF/UNDEV	1.50	2.00	2.00	2.00	1.00	2.00	2.63	0.62	54	3
9608123	THE CLUB EST.	10/03/96	HH	CYP/PN	RES/SF/UNDEV	1.50	2.00	2.00	2.50	0.50	2.00	2.63	0.63	54	4
3600033	DANIELS PKWY	10/10/96	KF	WP/MIT	HWY	2.00	N/A	1.50	3.00	2.00	2.50	3.00	0.78	55	1
3600033	DANIELS PKWY	10/10/96	HH	WP/MIT	HWY	1.00	N/A	2.00	2.50	1.00	2.00	3.00	0.64	55	2
3600033	DANIELS PKWY	10/10/96	DD	WP/MIT	HWY	2.50	N/A	2.00	3.00	1.00	2.00	3.00	0.75	55	3
3600033	DANIELS PKWY	10/10/96	SD	WP/MIT	HWY	2.50	N/A	1.50	3.00	2.50	2.50	3.00	0.83	55	4
9608197	RIVER BRIDGE	11/12/96	DD	MM	RES/GC	0.50	2.00	2.00	2.50	0.50	2.50	3.00	0.62	56	1
9608197	RIVER BRIDGE	11/12/96	SB(COE)	MM	RES/GC	0.50	2.00	3.00	3.00	0.50	3.00	3.00	0.67	56	2
9608197	RIVER BRIDGE	11/12/96	KF	MM	RES/GC	1.00	1.00	1.50	2.00	1.00	2.00	3.00	0.55	56	3
3602915	NFM COMM. PK.	10/10/96	KF	EM	REC	1.50	1.00	0.50	2.00	2.50	0.50	2.70	0.51	57	1
3602915	NFM COMM. PK.	10/10/96	DD	EM	REC	1.50	1.00	1.50	2.00	2.00	1.00	2.70	0.56	57	2
3602915	NFM COMM. PK.	10/10/96	SD	EM	REC	1.00	1.00	1.00	2.00	2.00	0.00	2.70	0.46	57	3
3601809	CRISAFULLI SERV	10/03/96	KF	MM	HICOMM	0.50	0.50	0.50	1.50	0.00	0.50	2.75	0.30	58	1
3601809	CRISAFULLI SERV	10/03/96	HH	MM	HICOMM	0.50	1.00	0.50	2.00	1.00	0.50	2.75	0.39	58	2
3601809	CRISAFULLI SERV	10/03/96	JM	MM	HICOMM	0.50	1.00	0.50	2.00	0.50	0.50	2.75	0.37	58	3
3601809	CRISAFULLI SERV	10/03/96	DD	MM	HICOMM	0.50	1.00	0.50	2.00	0.00	0.50	2.75	0.34	58	4
3602643	MANATEE PK.	10/10/96	KF	MH	REC	2.00	1.00	0.50	0.50	0.50	0.50	2.50	0.36	59	1
3602643	MANATEE PK.	10/10/96	SD	MH	REC	1.00	1.00	0.00	0.50	1.00	0.50	2.50	0.31	59	2
3602643	MANATEE PK.	10/10/96	DD	MH	REC	1.50	1.00	1.00	0.50	1.00	0.50	2.50	0.38	59	3
2600535	MILLS RANCH 31-2	01/21/97	RM	EM	AG/SUGAR	2.50	N/A	2.00	2.50	2.00	2.00	2.25	0.74	60	1
2600535	MILLS RANCH 31-2	01/21/97	BG	EM	AG/SUGAR	2.50	N/A	2.00	2.50	2.50	3.00	2.25	0.82	60	2
2600535	MILLS RANCH 31-2	01/21/97	BR	EM	AG/SUGAR	2.50	N/A	2.50	2.50	2.00	2.00	2.25	0.76	60	3
2600535	MILLS RANCH 31-2	01/21/97	BN	EM	AG/SUGAR	2.50	N/A	2.00	2.00	2.00	2.50	2.25	0.74	60	4
2600299	DEVILS G. DET-3	01/21/97	RM	CYP	AG/CITRUS	2.50	2.00	1.00	1.00	2.00	1.50	2.00	0.57	61	1
2600299	DEVILS G. DET-3	01/21/97	BN	CYP	AG/CITRUS	2.00	2.50	1.00	0.50	1.50	2.00	2.00	0.55	61	2
2600299	DEVILS G. DET-3	01/21/97	BG	CYP	AG/CITRUS	2.00	2.50	1.00	2.00	1.50	1.50	2.00	0.60	61	3
2600299	DEVILS G. DET-3	01/21/97	BR	CYP	AG/CITRUS	2.50	2.50	1.00	2.00	1.50	1.50	2.00	0.62	61	4

PERMIT NO.	PROJECT	DATE	EVALUATOR	WETLAND TYPE	LANDUSE	WU	O/S	GC	BUFF	E&N	HYD	WQ	WRAP	SITE	OBS
2600535	MILLS RANCH 19-7	01/21/97	RM	EM	AG/SUGAR	1.50	N/A	2.00	2.00	1.00	2.00	2.25	0.60	62	1
2600535	MILLS RANCH 19-7	01/21/97	BG	EM	AG/SUGAR	2.00	N/A	2.00	2.00	1.50	2.00	2.25	0.65	62	2
2600535	MILLS RANCH 19-7	01/21/97	BN	EM	AG/SUGAR	2.00	N/A	1.50	1.00	1.50	1.50	2.25	0.54	62	3
2600535	MILLS RANCH 19-7	01/21/97	BR	EM	AG/SUGAR	3.00	N/A	1.50	2.50	1.00	1.00	2.25	0.63	62	4
2600535	MILLS RANCH 20-14	01/21/97	BN	EM	AG/SUGAR	2.50	N/A	2.50	1.00	2.50	2.50	2.25	0.74	63	1
2600535	MILLS RANCH 20-14	01/21/97	RM	EM	AG/SUGAR	2.00	N/A	2.00	1.50	2.00	2.50	2.25	0.68	63	2
2600535	MILLS RANCH 20-14	01/21/97	BG	EM	AG/SUGAR	2.00	N/A	2.50	1.50	2.50	2.50	2.25	0.74	63	3
2600535	MILLS RANCH 20-14	01/21/97	BR	EM	AG/SUGAR	2.00	N/A	2.50	2.00	2.50	2.00	2.25	0.74	63	4
2600535	MILLS RANCH 20-13	01/21/97	BR	EM	AG/SUGAR	2.50	N/A	2.50	1.50	2.50	2.00	2.25	0.74	64	1
2600535	MILLS RANCH 20-13	01/21/97	BG	EM	AG/SUGAR	2.50	N/A	3.00	1.50	3.00	2.50	2.25	0.82	64	2
2600535	MILLS RANCH 20-13	01/21/97	BN	EM	AG/SUGAR	2.50	N/A	2.50	1.00	2.50	2.50	2.25	0.74	64	3
2600535	MILLS RANCH 20-13	01/21/97	RM	EM	AG/SUGAR	2.50	N/A	3.00	0.50	2.50	3.00	2.25	0.79	64	4
2600299	DEVILS G. #2	01/21/97	RM	EM	AG/CITRUS	2.50	N/A	1.00	1.50	2.00	1.50	2.00	0.58	65	1
2600299	DEVILS G. #2	01/21/97	BG	EM	AG/CITRUS	2.00	N/A	1.50	1.50	1.50	2.00	2.00	0.58	65	2
2600299	DEVILS G. #2	01/21/97	BR	EM	AG/CITRUS	2.50	N/A	2.00	1.50	2.00	1.00	2.00	0.61	65	3
2600299	DEVILS G. #2	01/21/97	BN	EM	AG/CITRUS	2.50	N/A	1.50	0.50	1.50	2.00	2.00	0.58	65	4
	ACME COMPLEX	01/22/97	RM	MM	INST	0.50	0.50	0.00	1.50	0.00	0.50	3.00	0.33	66	1
	ACME COMPLEX	01/22/97	BN	MM	INST	0.50	0.50	0.50	1.00	0.00	0.50	3.00	0.33	66	2
	ACME COMPLEX	01/22/97	BR	MM	INST	0.50	0.50	0.50	1.00	0.50	0.50	3.00	0.36	66	3
	CRIMINAL COMPLEX	01/22/97	RM	EM	INST	1.50	1.00	1.50	1.50	1.50	1.00	2.00	0.48	67	1
	CRIMINAL COMPLEX	01/22/97	BG	EM	INST	1.50	1.00	1.50	1.50	1.00	1.50	2.00	0.48	67	2
	CRIMINAL COMPLEX	01/22/97	BN	EM	INST	1.50	1.00	1.00	1.00	1.00	1.50	2.00	0.43	67	3
	CRIMINAL COMPLEX	01/22/97	BR	EM	INST	2.00	1.00	1.50	0.50	1.00	1.50	2.00	0.45	67	4
5002754	FEST. SHOPPES	01/22/97	RM	MM	REC	2.00	1.50	2.00	2.50	2.50	2.50	3.00	0.76	68	1
5002754	FEST. SHOPPES	01/22/97	BN	MM	REC	2.00	1.50	2.00	2.50	2.50	2.50	3.00	0.75	68	2
5002754	FEST. SHOPPES	01/22/97	BG	MM	REC	2.00	1.50	2.00	2.50	2.00	2.50	3.00	0.74	68	3
5002754	FEST. SHOPPES	01/22/97	BR	MM	REC	2.00	2.00	2.00	3.00	1.50	2.50	3.00	0.76	68	4
5003078	JUP COMM PK	01/22/97	BR	MM	REC	1.50	1.50	1.50	2.00	2.00	2.00	3.00	0.64	69	1
5003078	JUP COMM PK	01/22/97	RM	MM	REC	2.00	1.50	1.00	2.50	1.00	2.00	3.00	0.62	69	2
5003078	JUP COMM PK	01/22/97	BG	MM	REC	2.00	1.00	1.50	2.50	1.50	2.50	3.00	0.64	69	3
5003078	JUP COMM PK	01/22/97	BN	MM	REC	2.00	1.50	1.00	2.50	2.00	2.50	3.00	0.67	69	4
5003356	SCHOOL HHH	01/22/97	RM	MM	INST	1.50	1.50	2.00	1.00	2.50	2.00	2.25	0.70	70	1
5003356	SCHOOL HHH	01/22/97	BN	MM	INST	1.50	1.50	2.00	1.00	2.00	2.00	2.25	0.68	70	2
5003356	SCHOOL HHH	01/22/97	BR	MM	INST	1.50	2.00	2.00	1.00	2.00	2.00	2.25	0.71	70	3
4300848	FLORIDA CLUB	01/30/97	BG	EM/CREATED	RES/GC	1.50	N/A	2.00	0.50	2.00	2.50	1.25	0.54	71	1
4300848	FLORIDA CLUB	01/30/97	BN	EM/CREATED	RES/GC	1.50	N/A	2.00	1.50	2.00	2.00	1.25	0.57	71	2
4300848	FLORIDA CLUB	01/30/97	RM	EM/CREATED	RES/GC	1.50	N/A	1.50	1.50	2.00	2.50	1.25	0.57	71	3
4300848	FLORIDA CLUB	01/30/97	BG	EM/12	RES/GC	2.00	N/A	2.50	1.50	2.00	2.50	1.50	0.67	72	1
4300848	FLORIDA CLUB	01/30/97	RM	EM/12	RES/GC	2.00	N/A	2.50	1.50	2.00	2.50	1.50	0.67	72	2
4300848	FLORIDA CLUB	01/30/97	BN	EM/12	RES/GC	2.00	N/A	2.50	2.00	2.00	2.50	1.50	0.69	72	3
4300848	FLORIDA CLUB	01/30/97	RM	EM/14G	RES/GC	2.50	N/A	2.50	2.00	2.00	2.50	2.13	0.76	73	1
4300848	FLORIDA CLUB	01/30/97	BN	EM/14G	RES/GC	2.50	N/A	2.00	2.50	2.00	2.00	2.13	0.73	73	2
4300848	FLORIDA CLUB	01/30/97	BG	EM/14G	RES/GC	2.00	N/A	2.50	2.50	2.00	2.50	2.13	0.76	73	3
4300529	SOUTHWOOD	01/30/97	BG	EM	RES/SF	2.00	N/A	2.50	2.00	2.00	2.50	2.46	0.75	74	1
4300529	SOUTHWOOD	01/30/97	RM	EM	RES/SF	1.50	N/A	2.50	2.00	2.00	2.00	2.46	0.69	74	2
4300529	SOUTHWOOD	01/30/97	BN	EM	RES/SF	2.00	N/A	2.00	1.50	2.00	2.50	2.46	0.69	74	3
4300115	JENSEN PK. EST.	01/30/97	BG	EM/CREATED	RES/SF	1.50	N/A	2.00	1.00	1.50	2.00	1.25	0.51	75	1
4300115	JENSEN PK. EST.	01/30/97	RM	EM/CREATED	RES/SF	1.50	N/A	2.00	1.00	1.50	2.00	1.25	0.51	75	2
4300115	JENSEN PK. EST.	01/30/97	BN	EM/CREATED	RES/SF	1.50	N/A	1.50	0.50	1.50	2.00	1.25	0.46	75	3
5601136	OAKS @ I.R.	01/30/97	BN	MM	RES/SF	2.00	1.50	1.50	1.50	1.00	2.00	2.65	0.58	76	1
5601136	OAKS @ I.R.	01/30/97	RM	MM	RES/SF	1.50	1.00	2.00	2.00	1.50	2.00	2.65	0.55	76	2
5601136	OAKS @ I.R.	01/30/97	BG	MM	RES/SF	1.50	1.00	2.00	2.00	1.00	2.00	2.65	0.58	76	3
5600274	MIDPORT PARK	01/30/97	RM	EM	REC	2.00	N/A	1.00	2.00	1.00	1.50	2.25	0.54	77	1
5600274	MIDPORT PARK	01/30/97	BG	EM	REC	1.50	N/A	1.50	2.00	1.00	1.50	2.25	0.54	77	2
5600274	MIDPORT PARK	01/30/97	BN	EM	REC	1.50	N/A	1.50	2.00	1.00	1.50	2.25	0.54	77	3

PERMIT NO.	PROJECT	DATE	EVALUATOR	WETLAND TYPE	LANDUSE	WU	O/S	GC	BUFF	E&N	HYD	WQ	WRAP	SITE	OBS
5600680	OUTLET MALL	01/30/97	RM	EM/3	HICOMM	1.50	N/A	1.50	1.00	1.50	2.00	1.25	0.49	78	1
5600680	OUTLET MALL	01/30/97	BG	EM/3	HICOMM	1.50	N/A	1.50	1.00	2.00	2.00	1.25	0.51	78	2
5600680	OUTLET MALL	01/30/97	BN	EM/3	HICOMM	1.50	N/A	1.50	1.50	2.00	2.00	1.25	0.54	78	3
5600680	OUTLET MALL	01/30/97	BN	EM/2	HICOMM	1.00	N/A	1.50	0.50	1.50	2.00	0.75	0.40	79	1
5600680	OUTLET MALL	01/30/97	RM	EM/2	HICOMM	1.00	N/A	1.50	0.50	1.00	2.00	0.75	0.38	79	2
5600680	OUTLET MALL	01/30/97	BG	EM/2	HICOMM	1.00	N/A	1.50	0.50	1.50	2.00	0.75	0.40	79	3
3603165	CALOOSA. RIV.PK.	01/24/97	KF	EM/POND	REC	3.00	2.50	2.00	2.50	2.00	2.50	2.13	0.79	80	1
3603165	CALOOSA. RIV.PK.	01/24/97	HH	EM/POND	REC	2.50	2.50	2.50	2.50	2.00	2.00	2.40	0.78	80	2
3603165	CALOOSA. RIV.PK.	01/24/97	DD	EM/POND	REC	3.00	2.50	2.50	2.50	2.00	2.50	2.40	0.83	80	3
3603165	CALOOSA. RIV.PK.	01/24/97	JM	EM/POND	REC	3.00	2.50	2.00	2.50	2.00	2.00	2.40	0.78	80	4
3603165	CALOOSA. RIV.PK.	01/24/97	DM	EM/POND	REC	3.00	2.50	3.00	2.50	2.00	2.00	2.40	0.83	80	5
3603165	CALOOSA. RIV.PK.	01/24/97	HY	EM/POND	REC	3.00	2.00	2.00	3.00	2.00	2.00	2.40	0.78	80	6
960110-14	6 MILE MIT. BNK.	01/24/97	HH	FORESTED	REC	1.00	0.50	1.50	1.50	0.50	1.00	1.75	0.37	81	1
960110-14	6 MILE MIT. BNK.	01/24/97	KF	FORESTED	REC	0.50	1.00	1.00	2.00	0.00	1.00	2.00	0.36	81	2
960110-14	6 MILE MIT. BNK.	01/24/97	DD	FORESTED	REC	0.50	1.00	1.50	1.50	0.00	1.00	2.00	0.36	81	3
960110-14	6 MILE MIT. BNK.	01/24/97	JM	FORESTED	REC	0.50	0.50	1.50	2.00	0.50	1.50	1.75	0.39	81	4
960110-14	6 MILE MIT. BNK.	01/24/97	DM	FORESTED	REC	0.50	0.50	1.00	2.00	0.00	1.50	1.75	0.34	81	5
960110-14	6 MILE MIT. BNK.	01/24/97	SB	FORESTED	REC	1.00	0.00	2.50	2.00	0.00	2.00	1.00	0.40	81	6
960110-14	6 MILE MIT. BNK.	01/24/97	MB	FORESTED	REC	0.50	0.50	1.00	1.00	0.00	1.00	2.00	0.24	81	7
960110-14	6 MILE MIT. BNK.	01/24/97	HY	FORESTED	REC	2.00	1.00	0.00	1.00	0.00	0.00	2.00	0.28	81	8
960110-14	LEE CO. MIT. BANK	01/24/97	DM	MF	REC	2.50	3.00	3.00	2.00	2.50	2.50	2.40	0.85	82	1
960110-14	LEE CO. MIT. BANK	01/24/97	DD	MF	REC	2.00	3.00	3.00	2.50	2.50	2.50	2.40	0.85	82	2
960110-14	LEE CO. MIT. BANK	01/24/97	JM	MF	REC	2.00	3.00	3.00	2.50	2.00	2.50	2.40	0.82	82	3
960110-14	LEE CO. MIT. BANK	01/24/97	KF	MF	REC	2.00	3.00	3.00	1.50	2.50	2.50	2.40	0.80	82	4
960110-14	LEE CO. MIT. BANK	01/24/97	HH	MF	REC	1.50	2.50	2.50	2.50	2.50	2.50	2.40	0.78	82	5
960110-14	LEE CO. MIT. BANK	01/24/97	SB	MF	REC	2.00	3.00	3.00	2.50	2.50	2.50	2.75	0.87	82	6
960110-14	LEE CO. MIT. BANK	01/24/97	MB	MF	REC	2.50	3.00	3.00	1.50	2.50	2.50	2.40	0.83	82	7
960110-14	LEE CO. MIT. BANK	01/24/97	HY	MF	REC	2.00	3.00	3.00	2.00	2.00	2.50	3.00	0.83	82	8

WRAP ADDENDUM FOR MITIGATION BANKS

The MBRT promotes the following additional considerations in utilizing WRAP for the evaluation of a mitigation bank in Florida (and associated impact site):

Wildlife Utilization (Section 2.2.1.2)

To score a 1, variable descriptors will include: Minimal representation of species guilds.

To score a 2, variable descriptors will include: Moderate representation of species guilds.

To score a 3, variable descriptors will include: Optimal representation of species guilds.

The species compilations presented on the following pages are to be used as a guide in determining guild representation. This list is not all-inclusive.

FLORIDA WILDLIFE GUILDS

GUILD	WETLAND OBLIGATE AND FACULTATIVE SPECIES	
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	Common Name	Scientific Name
MAMMALS		
<u>Wetland Herbivores</u>	Round-tailed muskrat	<i>Neofiber alleni</i>
	White-tailed deer	<i>Odocoileus virginianus</i>
	Marsh rabbit	<i>Sylvilagus palustris</i>
	Rice rat	<i>Oryzomys palustris</i>
	Cotton mouse	<i>Peromyscus gossypinus</i>
	Beaver	<i>Castor canadensis</i>
<u>Wetland Carnivores and Omnivores</u>	River otter	<i>Lutra canadensis</i>
	Mink	<i>Mustela vison</i>
	Bobcat	<i>Lynx rufus</i>
	Florida panther	<i>Felis concolor coryi</i>
	Raccoon	<i>Procyon lotor</i>
	Black bear	<i>Ursus americanus</i>
	Virginia opossum	<i>Didelphis virginiana</i>
BIRDS		
<u>Wading Birds</u>	Wood stork	<i>Mycteria americana</i>
	Great blue heron	<i>Ardea herodias</i>
	Great egret	<i>Casmerodius albus</i>
	Green-backed heron	<i>Butorides striatus</i>
	Little blue heron	<i>Egretta caerulea</i>
	Reddish egret	<i>Egretta rufescens</i>
	Snowy egret	<i>Egretta thula</i>
	Tricolored heron	<i>Egretta tricolor</i>
	Roseate spoonbill	<i>Ajaia ajaja</i>
	White ibis	<i>Eudocimus albus</i>
	Glossy ibis	<i>Plegadis falcinellus</i>
	Black-crowned night heron	<i>Nycticorax nycticorax</i>
	Yellow-crowned night heron	<i>Nycticorax violaceus</i>
	American bittern	<i>Botaurus lentiginosus</i>
	Least bittern	<i>Ixobrychus exilis</i>
<u>Fish-Eating Birds</u>	Terns	<i>Sterna spp.</i>
	Black skimmer	<i>Rynchops niger</i>
	Belted kingfisher	<i>Ceryle alcyon</i>
	Brown pelican	<i>Pelicanus occidentalis</i>
	Common loon	<i>Gavia immer</i>
	Grebes	<i>Podiceps, Podilymbus</i>
	Mergansers	<i>Mergus spp.</i>
	Anhinga	<i>Anhinga anhinga</i>
	Double-crested Cormorant	<i>Phalacrocorax auritus</i>
<u>Water Birds</u>	Dabbling ducks	<i>Anas spp.</i>

Aquatic Invertebrate-Eating Birds

Plovers	<i>Charadrius spp.</i>
Black-necked stilt	<i>Himantopus mexicanus</i>
American avocet	<i>Recurvirostra americana</i>
Sandpipers and phalaropes	<i>Scolopacidae</i>
American oystercatcher	<i>Haematopus palliatus</i>
Snail kite	<i>Rostrhamus sociabilis</i>
Limpkin	<i>Aramus guarauna</i>
Rails	<i>Rallus spp.</i>

Insectivores

Tree swallow	<i>Tachycineta bicolor</i>
Sedge wren	<i>Cistothorus platensis</i>
Marsh wren	<i>Cistothorus palustris</i>
Black-whiskered vireo	<i>Vireo altiloquus</i>
Yellow-throated warbler	<i>Dendroica dominica</i>
Prothonotary warbler	<i>Protonotaria citrea</i>
Common yellow throat	<i>Geothlypis trichas</i>
Bachman's sparrow	<i>Aimophila aestivalis</i>
Grasshopper sparrow	<i>Ammodramus savannarum</i>
Sharp-tailed sparrow	<i>Ammodramus caudacutus</i>
Swamp sparrow	<i>Melospiza georgiana</i>
Red-winged blackbird	<i>Agelaius phoeniceus</i>

Raptors

Bald eagle	<i>Haliaeetus leucocephalus</i>
Osprey	<i>Pandion haliaetus</i>
Northern harrier	<i>Circus cyaneus</i>
Peregrine falcon	<i>Falco peregrinus</i>
Merlin	<i>Falco columbarius</i>
Swallow-tailed kite	<i>Elanoides forficatus</i>

REPTILES

Crocodylians

Alligator	<i>Alligator mississippiensis</i>
American crocodile	<i>Crocodylus acutus</i>

Aquatic Turtles

Florida snapping turtle	<i>Chelydra serpentina</i>
Peninsula cooter	<i>Chrysemys floridana</i>
Florida redbelly turtle	<i>Chrysemys nelsoni</i>
Yellowbelly slider	<i>Chrysemys scripta</i>
Florida chicken turtle	<i>Deirochelys reticularia</i>
Striped mud turtle	<i>Kinosternon bauri</i>
Florida mud turtle	<i>Kinosternon subrubrum</i>
Stinkpot	<i>Sternotherus odoratus</i>
Florida softshell	<i>Trionyx ferox</i>

Aquatic Snakes

Water snakes	<i>Nerodia spp.</i>
Striped crayfish snake	<i>Regina alleni</i>
Florida swamp snake	<i>Seminatrix pygaea</i>
Florida cottonmouth	<i>Agkistrodon piscivorus</i>

AMPHIBIANS

Treefrogs	<i>Hyla spp.</i>
Cricket frogs	<i>Acris spp.</i>
Chorus frogs	<i>Pseudacris spp.</i>
Eastern narrowmouth toad	<i>Gastrophryne carolinensis</i>
Eastern spadefoot	<i>Scaphiopus hoboooki</i>
True frogs	<i>Rana spp.</i>
Two-toed amphiuma	<i>Amphiuma means</i>
Dwarf salamander	<i>Eurycea quadridigitata</i>
Peninsula newt	<i>Notophthalmus viridescens</i>
Dwarf siren	<i>Pseudobranchius striatus</i>
Eastern lesser siren	<i>Siren intermedia</i>
Greater siren	<i>Siren lacertina</i>

FISH

Predatory Fishes

Largemouth bass	<i>Micropterus salmoides</i>
Gar	<i>Lepisosteus spp.</i>

Forage Fishes

Sunfish	<i>Centrarchidae</i>
Killifishes	<i>Cyprinodontidae</i>
Livebearers	<i>Poeciliidae</i>

AQUATIC MACROINVERTEBRATES

Crayfish	<i>Procambarus spp.</i>
Apple snail	<i>Pomacea paludosus</i>
Ram's horn snail	<i>Planorbella spp.</i>
Prawns	<i>Penaeus spp.</i>
Grass shrimp	<i>Palaemonetes paludosus</i>
Dragonflies	<i>Anisoptera</i>
Mayflies	<i>Ephemeroptera</i>
Aquatic beetles	<i>Dytiscidae/Gyrinidae</i>
	<i>Hydrophilidae</i>
Fishing spiders	<i>Dolomedes spp.</i>
Water striders	<i>Gerridae</i>
Aquatic bugs	<i>Hemiptera</i>
Leeches	<i>Hirudinea</i>
Water mites	<i>Hydracarina</i>
Aquatic moths	<i>Lepidoptera</i>

Water Quality (Section 2.2.6.1)

Selection of Water Quality Indicators

For initial mitigation bank establishment, selected water quality sampling is necessary to document baseline, site-specific water quality functions and to monitor any future anticipated water quality improvement over the life of the mitigation bank. The Water Quality Indicators described below are separated into General Field Parameters, which will be measured at all mitigation bank sites, and Potential Parameters for Specific Sites based on the land use categories adjacent to a specific mitigation bank. The final selection of water quality criteria and the frequency, location and duration of water quality sampling are designed to be flexible, and will be tailored to each mitigation bank based on discussions with the MBRT, water quality experts, and the prospective mitigation banker.

Water quality sampling at a proposed mitigation bank site should begin early in the planning process and is designed to supplement the WRAP scoring, not replace it. Initial water quality analyses and historic water quality information, if available, should be submitted for review by the MBRT in the Mitigation Bank Prospectus, or soon thereafter. In addition to documenting baseline conditions at a specific mitigation bank site, water quality data may document unique water quality issues needing resolution prior to bank approval. Data will also be utilized to quantifiably document improvement, or lack thereof, in water quality conditions over the life of the mitigation bank. As such, and if applicable, water quality criteria will be utilized during the establishment of credit release schedules and the ultimate release of credits based on documented water quality improvement.

1. Objectives: Quantifiable water quality criteria, which can be compared to current applicable state standards, should be used to assess proposed water quality improvements at mitigation bank sites. These criteria must be site-specific, and be able to target and determine water quality impacts from adjacent and nearby lands. Sampling and analyses of water quality parameters must be performed by HRS-approved laboratories using FDEP-approved methods.

2. General Field Parameters: The following should be measured within ALL potential mitigation sites:

Specific conductance, pH, Dissolved oxygen, Turbidity, Hydrogen sulfide, Biological oxygen demand (BOD), Total hardness, Total dissolved solids, Total organic carbon, Chemical oxygen demand (COD), Unionized ammonia, Total nitrogen, Total phosphorus. Mosquito control treatment history, if applicable, may identify additional specific water quality criteria which need to be measured.

3. Potential Parameters for Specific Sites: The selection of water quality criteria will be based on the following land use categories adjacent to a given mitigation bank on a case-by-case basis:

A. Agricultural lands/Golf courses: Pesticides (Chlordane, Endosulfan, Endrin, Heptachlor, Malathion, 2,4,5-TP, 2,4,-D, Aldrin, DDT).

B. Range/Pasture/Dairy and Feedlots: Total Coliform, Fecal coliform, and Pesticides (depending on management practices).

C. Residential/Commercial: Oils and greases, Pesticides, Aluminum, Chlorides, Total coliform, Fecal coliform, Chromium, Lead, Orthophosphate, Selenium, Semivolatile compounds, Volatile compounds, Zinc.

D. Industrial: Oils and greases, Pesticides, Aluminum, Chlorides, Chromium, Lead, Orthophosphate, Selenium, Semivolatile compounds, Volatile compounds, Zinc, Polynuclear aromatic hydrocarbons, Total Phenols, Polycyclic aromatic hydrocarbons, Phthalate esters, Polychlorinated biphenyls, Radioactive substances, Cyanides.

E. Highway: Oils and grease, Semivolatile compounds, Volatile compounds.

Note:

A site-specific quality assurance plan must be submitted with any proposed monitoring plan. The quality assurance plan must conform with FDER Guidelines For Preparing Quality Assurance Plans (DER-QA-001/85, dated January 30, 1986).

SECTION 5b - Wetland Function Weighting

WETLAND FUNCTION WEIGHTING

The “importance” or “value” of a given wetland function is a very different concept than the “capacity” of the function. Wetland functional assessment methodologies such as HGM and WRAP are used to evaluate changes in the capacity of wetland functions. The relative importance of the measured changes is not addressed in HGM. In other words, the HGM approach stops short of valuing the capacity of the function being evaluated. Unfortunately, trading in individual functional capacities is not practical; thus a single unit of trade is needed for mitigation crediting and debiting. In WRAP, the capacities of each function are averaged to produce a single output. Taking the average, however means that each of the factors is of equal importance. This approach can be refined. The Florida MBRT has devised a method to incorporate public interest considerations into the relative weighting of the wetland functions included in a given assessment methodology, with respect to use in mitigation banking.

WEIGHTING ASSIGNMENT GUIDANCE: This is a method through which relative weights can be assigned to wetland function. The Development Team proposes the following list of criteria to consider in a matrix form. As the MBRT considers the items on the list they can numerically score relative weights. This list is not inclusive and additional items could be added, as warranted. At a minimum, the following weighting criteria should be considered:

Established Watershed Issues
Benefits to Important Adjacent Areas
Threatened or Endangered Species
Scarce Habitats
Special Considerations

The MBRT should consider the following issues or questions to help rank the weight for a given function for a given polygon. Some of these criteria will apply to all polygons within a bank or impact site, while others may be specific to a particular polygon. The weighting of each WRAP variable should be done before WRAP is calculated in the field.

Below are the five descriptors used to calculate weighting. Rather than developing two weighting criteria, one for the bank and one for the impact site, the Florida MBRT combined them. With reference to weighting on the impact site, do not use the Threatened and Endangered Species descriptor. If listed species are affected by the project, the Federal agency will initiate section 7 consultation, in accordance with the Endangered Species Act of 1973, as amended, with the U.S. Fish and Wildlife Service.

Established Watershed Issues: The bank/project will result in identifiable ecological benefits/detriments to established watershed issues recognized to be critical to the watershed of the project. Such issues should be identified in publicly sanctioned plans. For example:

- SWIM plans
- The Reedy Creek/Lake Marion Creek Watershed Conservation Project
- National Estuary Program Comprehensive Conservation and Management Plans
- Strategic Habitat Conservation Area in the GAP analysis
- Aquifer Recharge Area

(Note: This weighting factor is scored a zero when a watershed plan has not been developed for the particular area or when a perceived benefit is not critical to the established plan.)

Benefits/Detriments To Important Adjacent Lands: The bank/project will result in identifiable ecological benefits/detriments to adjacent lands or waters of regional importance such as a State/National Park, State/National Forest, SWIM water body, OFW, AP, refuges and lands managed for conservation.

Threatened and Endangered Species: The establishment of the mitigation bank improves the status of federal and/or state-listed threatened or endangered species, or federally listed candidate species. Simply protecting or conserving a site which currently exhibits use by listed species, where the status of that species will not be identifiably improved, will be considered as maintaining the status-quo. For projects which affect a federally threatened or endangered species, this issue will be handled in accordance with section 7 of the Endangered Species Act. Do not use this descriptor on the impact site.

Scarce Habitats: The bank area contains (or will contain) ecological features considered to be unusual, unique or rare in the region and which are of sufficient size. (The project site will result in the loss of ecological features considered to be unusual, unique or rare in the region and which are of sufficient size.) Expansion or restoration of habitats which have been extensively lost in a region will generally be given greater consideration for this parameter.

Special Considerations: This criteria is reserved for other circumstances which may be considered important in the weighting of WRAP variables.

Weighting Criteria Worksheet: Following is a self-explanatory worksheet. Except for threatened and endangered species, a simple yes or no question is asked. A yes is scored 3 and a no is scored 0. The scoring for threatened and endangered species is further refined into increments of 0, 1, 2, and 3 according to the relative benefit that the mitigation bank will provide. However, if justifiable, other weighting criteria may also be scored in increments of 0, 1, 2, and 3.

WEIGHTING CRITERIA WORKSHEET FOR MITIGATION BANKS IN FLORIDA

Established Watershed Issues Yes 3 No 0	Score
Benefits to Important Adjacent Areas Yes 3 No 0	
Threatened and Endangered Species Increases population of one or more listed species 3 Meets identified tasks within a recovery plan for listed species or increases the population of one or more candidate species..... 2 Attracts listed species to the site 1 Maintains status quo 0	
Scarce Habitat Yes 3 No 0	
(Special Consideration) 3 0	

In order to determine the relative weighting numbers for the six WRAP variables, the following matrix example uses the polygon A2 referred in step 3, section 5f (Creekview example).

WEIGHTING CRITERIA MATRIX

Weighting Criteria	WU	VO	VG	AB	HY	WQ
Established Watershed Issues	3	NA	0	3	3	0
Benefits to Important Adjacent Areas	3	NA	0	0	3	3
Threatened or Endangered Species	1	NA	0	1	1	0
Scarce Habitats	0	NA	0	0	0	0
Special Considerations	0	NA	0	0	0	0
Total:	7	NA	0	4	7	3

KEY:

- WU = Wildlife Utilization
- VO = Vegetation-Overstory
- VG = Vegetation-Ground Cover
- AB = Adjacent Upland Buffer
- HY = Hydrology
- WQ = Water Quality

As presented in the hypothetical example Weighting Criteria Matrix above, the MBRT has determined that:

- o Established Watershed Issues: Applies to Wildlife Utilization and Hydrology variables.
- o Benefits to Important Adjacent Areas: Applies to Wildlife Utilization, Hydrology, and Water Quality variables.
- o Threatened and Endangered Species: Applies to Wildlife Utilization, Adjacent Upland Buffer and Hydrology variables.
- o Scarce Habitats: Does not apply (there are no scarce habitats on the site).
- o Special Considerations: No Special Considerations apply.

The Florida MBRT believes that each of the six WRAP variables should have an equal minimum weight. In other words, each weighting factor will have two components. A fixed “**minimum weight**” component that is automatically given to each variable and an “**assigned weight**” component which the MBRT determines. Each of these components will comprise 50 percent of the total weight. The **assigned weight** formula is now:

$$\text{Weight}_{\text{WU}} + \text{Weight}_{\text{VO}} + \text{Weight}_{\text{VG}} + \text{Weight}_{\text{AB}} + \text{Weight}_{\text{HY}} + \text{Weight}_{\text{WQ}} = 0.5$$

Based on the total scores from the Weighting Criteria Matrix, the following equation is derived:

$$7x + 0x + 4x + 7x + 3x = 0.5$$

(For this example, VO was not applicable; therefore, only five variables were used in the calculation for the assigned weight.)

Solving for x: $21x = 0.5$, so $x = 0.024$

Therefore, plugging 0.024 back into the weighting formula for these five variables gives the following **assigned weights**:

Assigned Weight WU = $7 \times 0.024 = 0.168$
Assigned Weight VO = NA
Assigned Weight VG = $0 \times 0.024 = 0.000$
Assigned Weight AB = $4 \times 0.024 = 0.096$
Assigned Weight HY = $7 \times 0.024 = 0.168$
Assigned Weight WQ = $3 \times 0.024 = 0.072$

Remember, once the MBRT calculates these assigned weights, the **minimum weight** must be added to each of the **assigned weights** to bring the **total weights** to 100%. For this example, one WRAP variable was dropped, VO; therefore the **minimum weight** is 0.1 ($.5/5=0.1$) [if all six variables were used, then the minimum weight would be 0.083 ($.5/6=0.083$)].

Total Weight WU = $0.1 + 0.168 = 0.268$
Total Weight VO = NA
Total Weight VC = 0.1
Total Weight AB = 0.196
Total Weight HY = 0.268
Total Weight WQ = 0.172

Prior to integration of these **total weights**, the following must be done with the “pure” WRAP variable scores (for each bank polygon):

- 1) The WRAP individual variable scores, both “with” and “without bank” are each divided by the maximum score attainable (3.0) in order to express in a percentage. Example: WU (with bank) = $2.5/3.0 = 0.83$; WU (without bank) = $1.0/3.0 = 0.33$. The “with” and “without” scores were taken from the example in Section 5f.
- 2) The difference of these scores is the unweighted WRAP “delta” (do for each of the five variables). Example: WU $\Delta = 0.5$

The **total weights** are then applied with the WRAP functional assessment as follows:

- 3) The “delta” for each WRAP variable is multiplied by the **total weight** (sum of the assigned weight and the minimum weight of 0.1, as used for this example) to calculate the weighted WRAP “delta”. Example: $WU = 0.5 \times .268 = 0.134$

VAR	UNWEIGHTED WRAP DELTA	TOTAL WEIGHT	WEIGHTED WRAP DELTA
WU	.5	.268	.134
VO	NA	NA	.NA
VG	.5	.1	.05
AB	.833	.196	.163
HY	.667	.286	.191
WQ	.333	.172	.057
SUM			.595

- 4) The sum of the six weighted WRAP variable deltas is then multiplied by the polygon acreage to calculate total “credits” available in that polygon (Temporal Lag multiplier has been left out here for simplicity).

Example: 10 acres (polygon A2) $\times 0.595 = 5.95$ credits

- 5) Finally, the credits available in each polygon are summed to calculate the total credits available in the mitigation bank.

Please refer to the **Creekview Mitigation Bank** example in Section 5f of this document for a step by step evaluation simulation for WRAP, including use of this weighting approach.

WHEN WEIGHTING FACTORS ARE NOT APPLICABLE: After reviewing the Weighting Criteria, the MBRT may elect not to apply any weighting factors at the mitigation bank or impact site. In this case, the WRAP scores will be the only basis in establishing credits and debits. See WRAP scoring methodology in Section 5a.

TEMPORAL LAG AND RISK

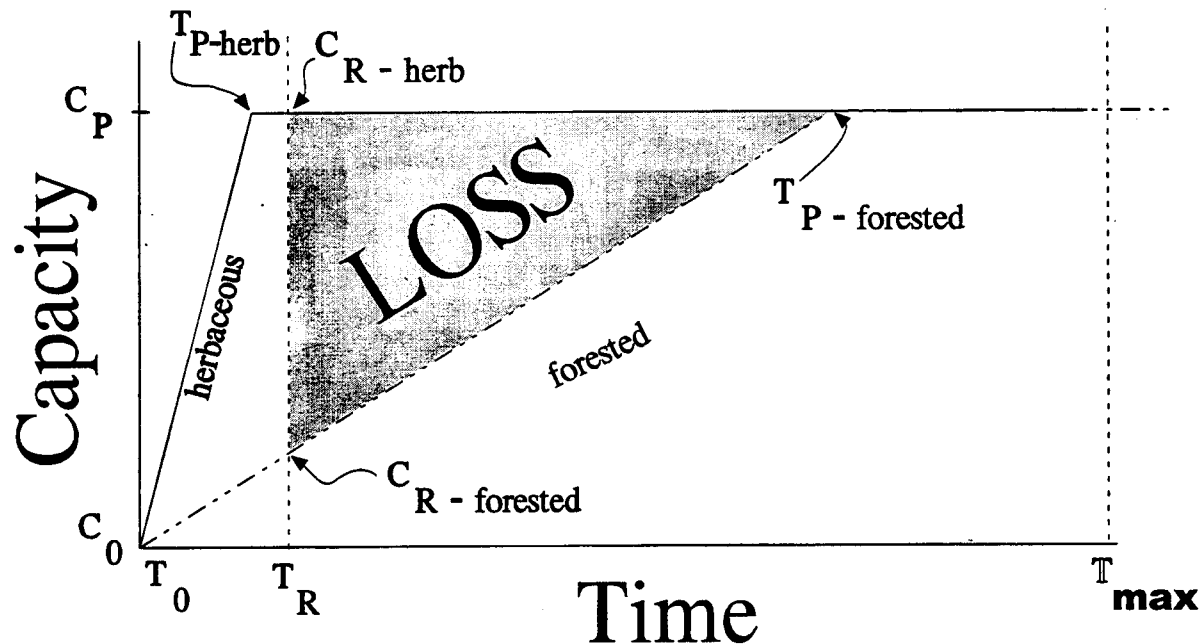
It is known from years of experience that many project specific mitigation plans undertaken by the permittee are fraught with; 1) **uncertainty** regarding the actual functional capacities that a mitigation project will ultimately achieve, 2) **risk** that the mitigation will in fact reach the predicted capacities within the predicted timeframe, and 3) **temporal losses** in wetland function resulting from the time lag between the elimination of the functions at the impact site and the gain in functions at the mitigation site. Typically, uncertainty, risk, and temporal losses have been accounted for in the determination of acreage based compensatory mitigation ratios.

In a mitigation bank however, uncertainty is reduced because the banker is assumed to be a wetland expert who has an incentive to ensure project success. Risk is reduced because credits are released in accordance with a performance based schedule (i.e., most of the credits are not released until the mitigation work has met success criteria). Risk is also attenuated by the required financial assurances. Nevertheless, it must be recognized that there is still some risk involved in mitigation banking. Short-term temporal losses in wetland function are also controlled, for the most part, though the credit release schedule. However, long-term temporal losses arise when the mitigation activity has a maturation period longer than the credit release schedule. This could be dealt with by extending the credit release schedule so that it coincides with the long-term maturation period, but a credit release schedule in excess of 10-years is not practical. This leaves long-term temporal losses and the, albeit reduced, uncertainty and risk unaccounted for.

Instead of taking the traditional approach of applying a ratio at the time credits are debited, it is more appropriate to "adjust" the bank credits for the long-term temporal losses, uncertainty and risk at the time they are awarded. This should help streamline the impact permit evaluation process. To account for these concerns, temporal lag (T) and risk (R) factors are included in the overall credit/debit formula. The T- and R- factors are based on work done by King et al (See Appendix F).

Risk. There has been and continues to be considerable discussion on a uniform guide to assign a score from 0.0 to 1.0 for risk (with 1.0 representing 100% likelihood that the anticipated stream of benefits will be received, or zero risk of failure). Administrative constraints on mitigation banks reduce noncompliance. Risk will usually be zero or minimal. However, a risk factor other than 1.0 can be assigned for most mitigation work that takes place outside of the bank administrative framework. The risk factor acts as a multiplier to the number of units that would be released. For example, with a risk of 10% failure, $R = 0.90$, and the number of units that would otherwise be released would be multiplied by 0.90. In addition, risk will typically vary by wetland function. For example, for a particular mitigation site, the risk of hydrologic improvement failing may be low but the risk of that wildlife improvements reach full success may be high if there are a large number of potential adjacent land-use influences beyond the control of the site manager. A detailed method for derivation of a risk percentage or multiplier will soon be available for review.

Temporal Lag Factor -The T-factor is essentially a present worth calculation intended to reconcile the streams of lost benefits from the wetlands degraded or lost at the impact site with those gained at the bank. The formula involves three periods of time in the life of a mitigation bank. Consider the following graph which plots the functional capacity against the maturation period for two different created wetlands.



T_0 = Begin construction of the bank.

T_R = End of the credit relapse schedule period.

T_P = The time it takes to reach C_P .

T_{MAX} = Planning horizon.

C_0 = Capacity at T_0 (i.e., existing conditions).

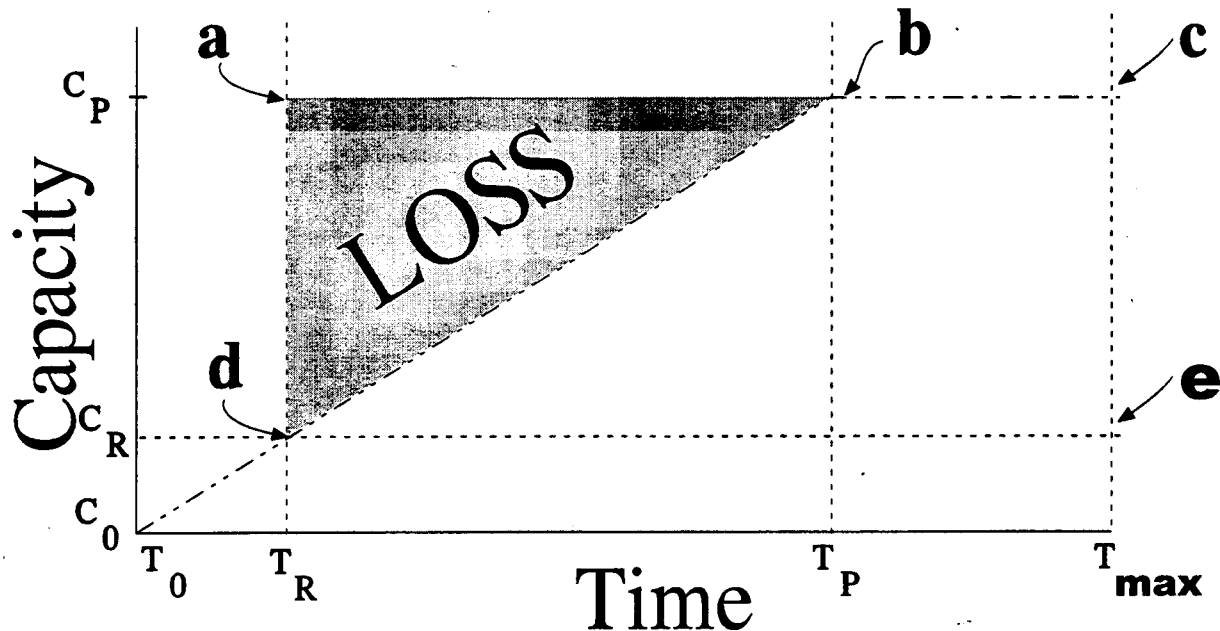
C_P = Predicted Capacity (i.e., with-bank).

C_R = Capacity at T_R (i.e., expected capacity when all credits have been released).

In this example, the herbaceous wetland reaches maturity at $T_{P-herbaceous}$ before the end of the credit release schedule at T_R . This means all the herbaceous credits can be released for debiting at the same rate C_P is achieved, thereby preventing any temporal lag. The number of credits released at time T_R could be calculated as $Units = (C_{R-herb} - C_0) * Acres_{herbaceous}$. ("*" means to multiply.) In the case of the forested wetland however, $T_{P-forested}$ is not achieved until long after T_R .

The shaded area represents the stream of lost benefits. The shaded area represents the difference between: (1) the stream of benefits that would have been received from the forested area from time T_R to time T_P if the forested area had fully matured at time the credits were released; and, (2) the stream of benefits actually received from the forested wetland. If this loss was ignored, the number of credits released at time T_R would be calculated as $Units = (C_P - C_0) *$

Acres_{forested}. Instead, a Temporal Factor (T1) will be used to adjust the number of units as a result of the loss: $\text{Units} = [(C_P - C_{R\text{-forested}}) * T1 * \text{Acres}_{\text{forested}}] + [(C_{R\text{-forested}} - C_0) * \text{Acres}_{\text{forested}}]$. Note that the units earned prior to the date of the credit release are not reduced by the T1 factor.



The T1 factor is therefore calculated as a ratio. $T1 = (\text{area of polygon EDBC}) / (\text{area of polygon EDAC})$. Points C are located at T_{\max} , the planning horizon for the calculation of the stream of benefits. However, as described by King, et al. the benefits lost in the years closer to the time of credit release (T_R) are not equal to the benefits received in later years. Each year's benefits are then "discounted" to an equivalent "Present Worth" (PW) of the benefit, the PW calculated at the year of credit release.

We will use 70 years as the planning horizon (T_{\max}). This is the period of time over which the benefits lost or gained will be summed. There are many determinants that can be used to set the value of T_{\max} . However, the primary determinant in this case is a result of the "discounting" of each year's benefits to a "Present Worth". At 7.38% discount rate, a benefit of 1.0000 received in Year 70 has a Present Worth of only 0.0068. Therefore, summing any benefits received after Year 70 will have minimal influence on the calculation of T1 unless we go to a large number of decimals.

The formula found in King et al. performs this calculation. Unfortunately (for us), the formula cannot be used "as-is". First, the formula presumes that the nature of the impact site is known so that the functional capacity of the mitigation site is measured as a percentage of the impact site. However, in the case of mitigation banks, the impact site is not known. Therefore, the equation must be rewritten to express the mitigation site against some absolute functional capacity scale from 0.0 to 1.0. Second, the formula results in a ratio of acres of a single polygon of mitigation required to balance the stream of benefits from a single polygon of impact. In the case of a bank,

there may be multiple polygons, for example, one of herbaceous wetland and another of forested wetland, and the accounting of multiple ratios would quickly become cumbersome. For day to day use, a T1 factor table has been prepared rather than requiring calculation each time. To understand how the table was derived, please refer to Appendix F.

The following table provides the T factor for varying circumstances.

YS = Year Start. (a) If the construction and planting activities for the polygon commence within the credit release year (T_R), then $YS = 1$. (b) If the construction and planting activities for the polygon commence prior to the credit release year (T_R), then $YS = -1$ if one year prior, -2 if two years prior, etc. (c) The values for $YS = +2, +3, +4$ and $+5$ are included in the table generally for convenience of those who will be using the T factor for non-mitigation-bank projects, where the individual circumstances (such as construction timing) warrant initiation of mitigation work after the date of impact. $YS = 1 +$ the number of years after the year of impact. For example, if the impact occurs in year 2 but the mitigation is phased to start construction in year 3, then $YS = 2$).

YF = Year Finish. If the mitigation polygon is expected to reach full maturity within or before the credit release year (T_R), then $YF = 1$. Full maturity is that functional capacity that is expected to be maintained by the management practices for the planning horizon, 70 years. If the polygon will reach full maturity after the credit release year (T_R), then $YF = 1 +$ the number of years after credit release (for example, if the credits are released in year 5 but the mitigation is expected not to be mature until year 40, then $YF = 35$).

For application of the T-factor to mitigation banks, the year of "credit release" will actually be the end of the anticipated credit release schedule.

(Table found on following pages)

YF=	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	
YS=																
-1	T=	1.0000	0.977	0.949	0.921	0.892	0.865	0.838	0.812	0.787	0.763	0.740	0.718	0.697	0.676	0.657
-2	T=	1.0000	0.983	0.959	0.934	0.908	0.881	0.856	0.831	0.806	0.783	0.760	0.738	0.717	0.697	0.677
-3	T=	1.0000	0.986	0.966	0.943	0.919	0.895	0.870	0.846	0.822	0.799	0.777	0.756	0.735	0.715	0.695
-4	T=	1.0000	0.988	0.971	0.950	0.928	0.905	0.882	0.859	0.836	0.814	0.792	0.771	0.750	0.730	0.711
-5	T=	1.0000	0.990	0.975	0.956	0.935	0.914	0.892	0.870	0.848	0.826	0.805	0.784	0.764	0.745	0.726
1	T=	1.0000	0.9654	0.9324	0.9008	0.8707	0.8420	0.8145	0.7884	0.7632	0.7393	0.7164	0.6945	0.6735	0.6534	0.6341
2	T=		0.9308	0.8985	0.8678	0.8384	0.8104	0.7836	0.7580	0.7337	0.7102	0.6880	0.6667	0.6463	0.6267	0.6080
3	T=			0.8663	0.8363	0.8077	0.7803	0.7542	0.7292	0.7054	0.6828	0.6609	0.6403	0.6204	0.6014	0.5832
4	T=				0.8062	0.7783	0.7517	0.7367	0.7018	0.6786	0.6564	0.6354	0.6150	0.5958	0.5773	0.5596
5	T=					0.7503	0.7243	0.6996	0.6757	0.6531	0.6315	0.6108	0.5913	0.5722	0.5544	0.5371

YF=	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	
YS=																
-1	T=	0.638	0.620	0.603	0.587	0.571	0.556	0.541	0.527	0.513	0.500	0.488	0.476	0.464	0.453	0.442
-2	T=	0.658	0.640	0.623	0.606	0.590	0.575	0.560	0.546	0.532	0.519	0.506	0.494	0.482	0.471	0.460
-3	T=	0.676	0.658	0.641	0.624	0.608	0.593	0.578	0.563	0.549	0.536	0.523	0.511	0.499	0.487	0.476
-4	T=	0.693	0.675	0.657	0.641	0.624	0.609	0.594	0.579	0.565	0.552	0.539	0.527	0.514	0.503	0.492
-5	T=	0.707	0.689	0.672	0.656	0.639	0.624	0.609	0.594	0.580	0.567	0.554	0.541	0.529	0.517	0.506
1	T=	0.6157	0.5980	0.5811	0.5649	0.5493	0.5343	0.5200	0.5062	0.4930	0.4803	0.4681	0.4564	0.4451	0.4342	0.4238
2	T=	0.5901	0.5729	0.5565	0.5407	0.5256	0.5111	0.4971	0.4838	0.4710	0.4587	0.4468	0.4355	0.4245	0.4140	0.4039
3	T=	0.5657	0.5491	0.5331	0.5177	0.5031	0.4890	0.4755	0.4625	0.4501	0.4381	0.4267	0.4156	0.4051	0.3949	0.3851
4	T=	0.5426	0.5264	0.5108	0.4960	0.4817	0.4680	0.4549	0.4423	0.4302	0.4187	0.4075	0.3969	0.3866	0.3767	0.3673
5	T=	0.5206	0.5049	0.4897	0.4882	0.4614	0.4481	0.4354	0.4232	0.4114	0.4002	0.3894	0.3791	0.3691	0.3596	0.3504

YF=	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	
YS=																
-1	T=	0.432	0.422	0.413	0.403	0.394	0.386	0.377	0.369	0.362	0.354					
-2	T=	0.449	0.439	0.429	0.420	0.411	0.402	0.393	0.385	0.377						
-3	T=	0.465	0.455	0.445	0.436	0.426	0.417	0.409	0.400							
-4	T=	0.481	0.470	0.460	0.450	0.441	0.432	0.423								
-5	T=	0.495	0.485	0.474	0.464	0.455	0.446									
1	T=	0.4137	0.4040	0.3947	0.3857	0.3771	0.3687	0.3607	0.3529	0.3454	0.3381	0.3312				
2	T=	0.3942	0.3848	0.3758	0.3671	0.3587	0.3507	0.3429	0.3354	0.3282	0.3212	0.3144	0.3079			
3	T=	0.3757	0.3666	0.3579	0.3495	0.3414	0.3336	0.3261	0.3189	0.3119	0.3051	0.2986	0.2923	0.2863		
4	T=	0.3581	0.3494	0.3409	0.3328	0.3250	0.3175	0.3102	0.3032	0.2965	0.2900	0.2837	0.2776	0.2718	0.2661	
5	T=	0.3415	0.3331	0.3249	0.3170	0.3095	0.3022	0.2952	0.2884	0.2819	0.2756	0.2696	0.2637	0.2581	0.2526	0.2474

(Table continues next page)

	YF=	42	43	44	45	46	47	48	49	50	51	52	53	54	55	56
YS=																
-1	T=	0.340	0.333	0.327	0.320	0.314	0.308	0.302	0.297	0.292	0.287	0.282	0.277	0.272	0.267	0.263
-2	T=		0.332	0.326	0.320	0.314	0.308	0.302	0.296	0.291	0.286	0.281	0.276	0.272	0.267	0.263
-3	T=			0.326	0.320	0.314	0.308	0.302	0.297	0.291	0.286	0.281	0.277	0.272	0.267	0.263
-4	T=				0.321	0.315	0.309	0.303	0.298	0.292	0.287	0.282	0.277	0.273	0.268	0.264
-5	T=					0.316	0.310	0.305	0.299	0.294	0.289	0.284	0.279	0.274	0.270	0.265
1	T=	0.3241	0.3175	0.3116	0.3051	0.2992	0.2935	0.2880	0.2830	0.2774	0.2728	0.2679	0.2632	0.2586	0.2542	0.2499
2	T=		0.3013	0.2952	0.2897	0.2837	0.2781	0.2728	0.2677	0.2630	0.2578	0.2535	0.2490	0.2446	0.2404	0.2362
3	T=			0.2801	0.2744	0.2693	0.2636	0.2585	0.2535	0.2488	0.2445	0.2396	0.2356	0.2314	0.2273	0.2234
4	T=				0.2603	0.2550	0.2503	0.2450	0.2402	0.2356	0.2311	0.2272	0.2226	0.2190	0.2150	0.2112
5	T=					0.2419	0.2370	0.2326	0.2276	0.2232	0.2189	0.2148	0.2111	0.2068	0.2035	0.1998
	YF=	57	58	59	60	61	62	63	64	65	66	67	68	69	70	
YS=																
-1	T=	0.259	0.254	0.250	0.246	0.243	0.239	0.235	0.232	0.228	0.225	0.222	0.218	0.215	0.212	
-2	T=	0.258	0.254	0.250	0.246	0.242	0.238	0.235	0.231	0.228	0.224	0.221	0.218	0.215	0.212	
-3	T=	0.259	0.254	0.250	0.246	0.242	0.239	0.235	0.232	0.228	0.225	0.222	0.218	0.215	0.212	
-4	T=	0.260	0.255	0.251	0.247	0.243	0.240	0.236	0.233	0.229	0.226	0.222	0.219	0.216	0.213	
-5	T=	0.261	0.257	0.253	0.249	0.245	0.241	0.238	0.234	0.231	0.227	0.224	0.221	0.218	0.215	
1	T=	0.2457	0.2416	0.2377	0.2339	0.2302	0.2265	0.2230	0.2196	0.2163	0.2131	0.2099	0.2069	0.2039	0.2010	
2	T=	0.2322	0.2283	0.2246	0.2209	0.2173	0.2139	0.2105	0.2072	0.2041	0.2010	0.1979	0.1950	0.1922	0.1894	
3	T=	0.2195	0.2158	0.2122	0.2087	0.2052	0.2019	0.1987	0.1956	0.1925	0.1896	0.1867	0.1839	0.1811	0.1785	
4	T=	0.2075	0.2040	0.2005	0.1971	0.1938	0.1907	0.1876	0.1846	0.1816	0.1788	0.1761	0.1734	0.1708	0.1682	
5	T=	0.1962	0.1928	0.1895	0.1862	0.1831	0.1800	0.1771	0.1742	0.1714	0.1687	0.1660	0.1635	0.1610	0.1585	

Example: If the banker commences restoration, enhancement, or creation in the first year of bank operation (year 1) with a 5 year credit release schedule (credit release in year 5) and the agreed upon maturation time for the wetland system is 40 years, the T Factor is 0.455. This is found on the table where $YS = -5$ and $YF = 35$. $YS = -5$ because the banker commenced work five years prior to the credit release year. $YF = 35$ because the wetland matures 40 years after the commencement of the bank operation, but 34 years after the credit release year.

SECTION 5d - Proximity Factor

CALCULATING A PROXIMITY FACTOR

As discussed in Section 4, "Mitigation Service Areas", the importance of proximity between the impact and mitigation sites will vary with the individual wetland function being considered. The following is an example of a method to calculate a proximity factor (multiplier). Other methods to calculate a proximity factor may be considered by the Florida MBRT. The Florida MBRT discourages large mitigation service areas which incorporate numerous watersheds.

The usual suite of wetland functions were lumped into two broad categories and simple scoring methods for each are proposed. Functions were categorized by considering whether or not they were only applicable (most of the time) within the watershed of the impact site being examined. With the exception of wildlife habitat support for some species, most functions are best offset within the same watershed. To address wildlife habitat support functions, a simple checklist is used to rate the ability of the bank to offset habitat loss at the impact site for an array of fish and wildlife guilds. For the remaining functions, the concept of "diminishing relevance" is introduced.

Fish and Wildlife - For this component of the Px-factor, the following array of guilds has been identified which represent fish and wildlife assets for a variety of habitats.

Neotropical Migrants
Wading Birds
Raptors
Waterfowl
Amphibians

Reptiles
Freshwater Fish
Small Mammals
Large Mammals
Invertebrates

The reviewer selects those guilds that would be represented at the impact site. Next, the reviewer answers yes or no to the following question: **Is the mitigation bank's ability to offset the habitat needs of the following guilds substantially reduced due to its location relative to the impact site location?** Dividing the number of "yes answers" by the total number of guilds that were selected produces a numeric score. For example, from the array of guilds, the reviewer selected six guilds that best represent those species that would use habitats at the impact site. Next the reviewer answered the operative question with a yes or no as listed in the table below:

GUILD	YES/NO
Neotropical Migrants	NO
Wading Birds	YES
Waterfowl	NO
Amphibians	YES
Freshwater Fish	YES
Small Mammals	YES

Four out of six answers are yes, so the score for the fish and wildlife component of the Px-factor is

$$4 \div 6 = 0.67$$

Diminishing Relevance - This concept is based on the premise that the relevance of the mitigation effort is diminished as the primary watersheds of the mitigation site and impact site become further removed. Diminishing relevance expresses the relationship of the mitigation bank to the service area and how it relates to the impact site. It is not necessarily proportional to distance from the bank to the impact site. It may also express the relationship of the bank to adjacent basins or larger systems outside the service area.

An out-of-state example of this concept carried to the extreme would be impact to wetlands on the westerly side of the Appalachian Trail at Chattahoochee Gap mitigated with credits from a bank on the easterly side of the trail 50 yards away. The impact occurs in the Tennessee/Mississippi River System and mitigation occurs in the Chattahoochee/Apalachicola River System. The only common or shared hydrologic continuum would be the Gulf of Mexico. Such divergent watersheds might be geographically adjacent but should not be considered for inclusion into the same service area. Under state ERP rules, unacceptable cumulative impacts to a drainage basin cannot be permitted.

An in-state example of geographically and hydrologically adjacent watersheds that could be located in the same service area would be impact in the Lake Woodruff Unit with compensatory mitigation located in the Lake Monroe Unit as shown on the Regional Watersheds of the SJRWMD for Mitigation Banks map. The impact site and the bank from which credits are drawn in this example are hydrologically connected. This is a hypothetical example; the service area for each bank is determined by the MBRT.

By the time a mitigation bank is ready for business, the banking instrument (MBI) has been finalized, and the number of credits available in a bank have been calculated using some form of functional assessment procedure (currently WRAP). The credits available in the bank are an expression of a finite range, or amount, of functions performed by the wetlands of that mitigation bank. This range is a subset of the amount of functions performed by wetlands in the watershed(s) of the service area. We need to compensate for the situation that, as the service area gets larger, the bank may become more biologically and hydrologically removed from, and less relevant to, the impact sites. To do this, the proportion of the amount of functions performed by the bank is compared to the sum of the amounts of functions available in all of the watersheds in the service area which are shared by the impact site and the bank location.

A simple way to numerically score this concept is to proportionally relate the total area of the aggregate watersheds needed to encompass both the bank and impact sites with the area of watershed of the bank site alone. Please refer to Figure 5d-1. There are four watersheds labeled A-D. The bank site is located in watershed A. Impact Site W is also located in watershed A, Impact Site X is located in watershed B, Impact Site Y is located in watershed C, and Impact Site

Z is located in watershed D. The acreage of each watershed is shown in the following table:

WATERSHED	ACREAGE
A	176,898
B	63,953
C	161,250
D	120,498

The relevance component of the Px-factor for each Impact Site is calculated as follows:

Impact Site W - Both the bank and Impact Site W are located in watershed A so the raw score for the relevance component is simply

$$176,898 \div 176,898 = 1.0$$

Impact Site X - Watersheds A and B encompass both the bank site and Impact Site X. The combined area of Watersheds A and B are then divided by the area of Watershed A. The raw score for the relevance component for Impact Site X is

$$(176,898 + 63,953) \div 176,898 = 1.34$$

Impact Site Y - Watersheds A and C encompass both the bank site and Impact Site Y. The combined area of Watersheds A and C are then divided by the area of Watershed A. The raw score for the relevance component for Impact Site Y is

$$(176,898 + 161,250) \div 176,898 = 1.91$$

Impact Site Z - Watersheds A, B, C, and D encompass both the bank site and Impact Site Z. The combined area of Watersheds A, B, C, and D are then divided by the area of Watershed A. (note: since Watershed A is not contiguous with Watershed D, both of the intervening Watersheds B and C must be included in the total. The raw score for the relevance component for Impact Site Z is

$$(176,898 + 63,953 + 161,250 + 120,498) \div 176,898 = 2.95$$

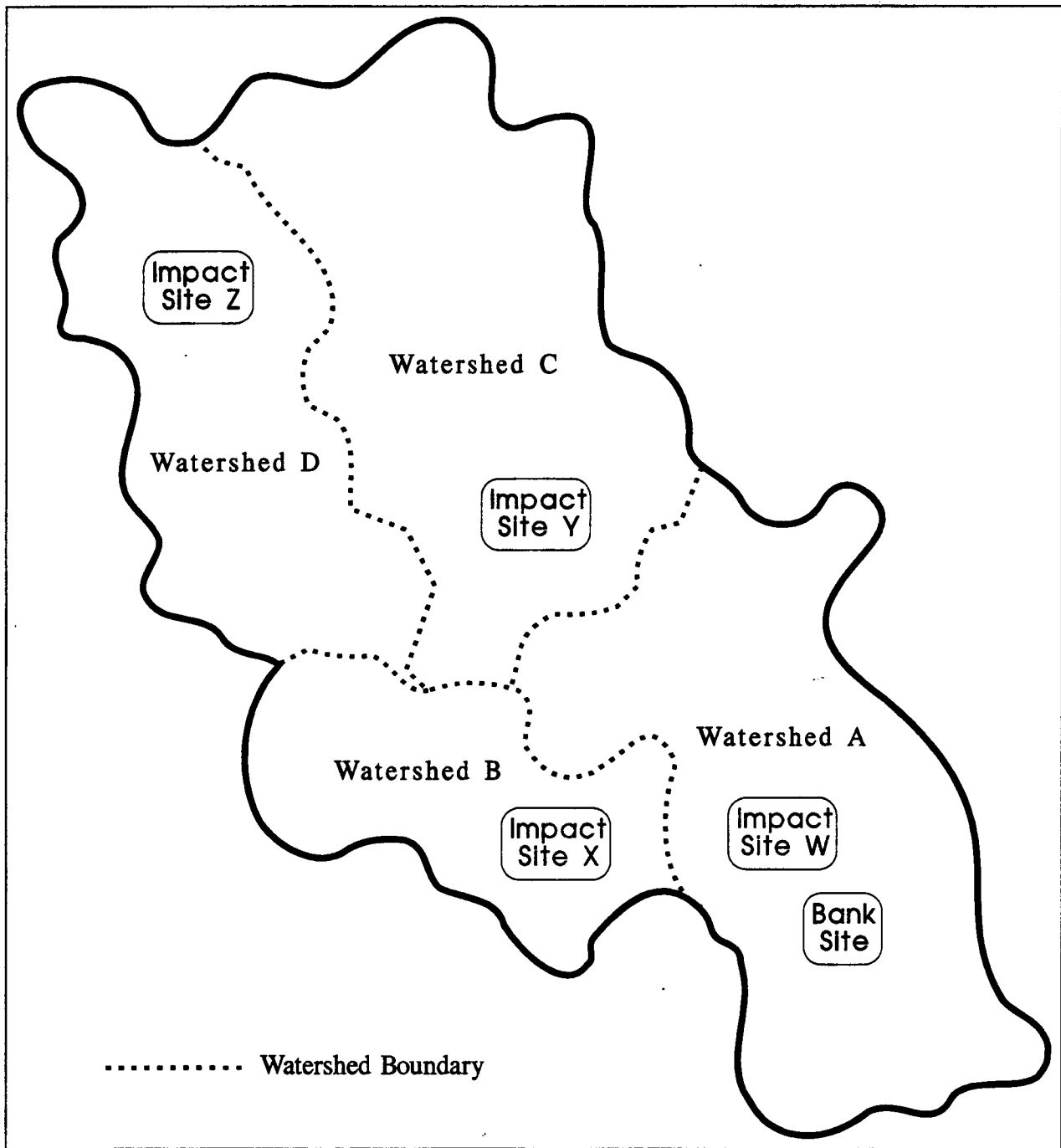


Figure 5d -1

To make the raw scores of the relevance component consistent with the 0.0-1.0 ranking scheme, a simple relationship is established where the lowest possible raw score (which will always be 1.0) is set equal to the lowest relevance score of 0.0 and the highest possible raw score (which will vary) is set equal to the highest relevance score of 1.0. Scores in between are interpolated. The converted relevance scores for the example are:

Impact Site Location	Raw Score	Relevance Factor
Impact Site W	1.0	0.0
Impact Site X	1.34	0.45
Impact Site Y	1.91	0.64
Impact site Z	2.95	1.0

This calculation need only be done once because a table of relevance scores for each watershed in the MSA for a given bank can be incorporated into the MBI for the bank.

Impact Site Location	Relevance Factor
Watershed A	0.0
Watershed B	0.45
Watershed C	0.64
Watershed D	1.0

The fish and wildlife and relevance components are equally weighted to produce the total proximity factor. In other words, (Fish and Wildlife + Relevance)÷2=Proximity Factor. Using the fish and wildlife component of 0.67, the proximity factor for an impact site located in Watershed C would be

$$(0.67+0.64)\div 2=0.66$$

One (1) must be added to this proximity factor before multiplication. So the factor 1.66 would be multiplied by the total number of debits associated with the particular impact site. For example, if this particular impact site exhibits 7.85 debits, then 13.03 credits would be required from the mitigation bank.

SECTION 5e - Credit Release

CREDIT RELEASE

A portion of the total bank credits may be released after property ownership transfer and/or conservation easement execution (assuming an approved MBI) as an up-front issuance prior to bank construction. Ideally, these will be preservation-oriented credits calculated by subtracting the "without" bank credit allotment from the "existing" condition credit allotment. By removing any demonstrable threat of degradation associated with the "without" bank scenario, the release of these credits can be ecologically justifiable as preservation credits. In some circumstances, there will be negligible ecological degradation associated with a particular "without" bank scenario when compared to existing conditions, i.e., no true preservation credits available. The Florida MBRT recognizes that some "up-front" capital is usually needed by the banker for operation. For this reason, a 10 percent maximum up-front credit release may be acceptable (10% of total bank credits). This 10 percent can also be used as a granted base, should true preservation credits be less than 10 percent. If true preservation credits exceed the 10 percent base, they are of course acceptable.

Credits remaining are those resulting from the subtraction of "existing" condition credits from the "with" bank credits. The release of these credits should be clearly based upon the attainment of success criteria. There are normally two components of this remaining credit pool. The first is the construction component, where success criteria would normally be based on the ecological lift associated with the successful completion of bank construction/initial undesirable plant eradication activities. The second component entails success criteria dependent upon monitoring for measurement. The bulk of credits should ideally be held up for release through this component. The attendant success criteria should be as site specific and quantifiable as possible, and should ideally be tied into the functional assessment which was used to generate the credits (through a suite of functions). Success criteria should be able to measure the functional lift by which credits were awarded in order to justify release. The release of credits will be at the discretion of the MBRT. Refer to Section 5b, Step 9 of the Creekview example for additional discussion.

EXAMPLE - CREEKVIEW MITIGATION BANK

The following stepwise example uses the bank credit formula described in Section 5. Some portions of the narrative descriptions of the existing conditions, mitigation plan and WRAP analysis are simplified in order to keep the example brief. Actual submittals to the MBRT for a bank should contain sufficient detail to support the proposal.

CREEKVIEW MITIGATION BANK

Existing conditions of the bank site.

Please refer to the diagram at the end of this section labeled "Existing Condition". The bank property covers a total area of approximately 340 acres composed of the following cover classifications.

Upland/Wetland Number	Acreage	Habitat Type
W1	90 acres	Freshwater Forested Wetland
W2	23 acres	Freshwater Forested Wetland
W3	12 acres	Freshwater Herbaceous Wetland
W4	10 acres	Freshwater Forested Wetland
W5	40 acres	Freshwater Forested Wetland
U1	140 acres	Upland Forest
U2	25 acres	Upland Pasture

The bank site is located adjacent to Crippled Creek and is bordered by the Crippled Creek Wildlife Refuge (CCWR) and the Creekview residential subdivision. Historically, the tract was upland flatwoods interspersed with depressional forested wetlands and depressional herbaceous wetlands. The forested wetland W3 and herbaceous wetland W4 were ditched in the 1930's resulting in reduced hydroperiods. Over time, the areal extent of both of these wetlands was also reduced. The vegetative composition of the canopy surrounding the western perimeter of W3 shifted from wetland species to upland species with the encroachment of some invasive exotic species. Upland area U2 was converted from flatwoods to improved pasture. Forested wetland W5 was partially filled in the 1950's when the Creekview subdivision was initially developed. The portion of the Crippled Creek floodplain W1 adjacent to the improved pasture suffered secondary impacts due to the conversion. Forested wetland W2 was not directly impacted and is relatively undisturbed by secondary impacts.

The Mitigation Plan

The banker proposes to restore the hydroperiod of the ditched wetlands W3 and W4 by completely backfilling the ditch. Once the hydroperiod is restored, the extent of these wetlands is expected to expand approximately 10% to their original sizes (W3 expands to 13.2 acres representing a 1.2 acre increase and W4 expands to 11 acres representing a 1 acre increase). The canopy of the existing upland forest surrounding the western perimeter of W3 is expected to shift back to a wetland composition and planting is not proposed. The area surrounding the eastern perimeter of W3 that expands into the current pasture will be planted with a natural mix of hardwood species to accelerate revegetation. The area of existing pasture surrounding W4 that becomes wetland again is expected to revegetate with herbaceous wetland species. The existing pasture grasses in the revegetation area will be removed to reduce competition. The remaining area of U2 is to be rehabilitated to a flatwoods community through the planting of pines, palmetto and wiregrass. As is the requirement of all mitigation banks, the Banker will encumber the tract with a conservation easement. A long term management plan is proposed that includes the maintenance of the natural fire regime. Financial assurances will be provided (construction bonding and long-term management trust fund). Long-term management will be assumed by the CCWR upon complete debit of the bank.

Stepwise application of the Joint State/Federal Mitigation Bank Crediting Procedure.

Step 1 Describe the existing conditions and the with- and without-bank scenarios: (note: in order to reduce the complexity of this example, descriptions have been kept brief. The descriptions provided by Bankers in actual submittals will be expected to adequately support the various scenarios upon which credits will be based.) The existing conditions were described previously. Please refer to the diagrams at the end of this section labeled "With Bank" and "Without Bank". The with-bank scenario is essentially the conditions described in the mitigation plan. Consideration of the without-bank scenario allows for quantification of the preservation value of the bank. Therefore, the determination of an appropriate without-bank scenario should be based on a demonstrable threat of aquatic function degradation due to human activities that might not otherwise be expected to be restricted. The existence of a demonstrable threat will be based on clear evidence of destructive land use changes which are consistent with local and regional land use trends and are not the consequence of actions under the control of the bank sponsor. In the without-bank scenario for this example, the site is developed as "Creekview Phase II". This would involve "squaring off" of a few of the residential lots in wetlands W3 and W4. This is a reasonable without-bank scenario because the area is experiencing rapid population growth, "Creekview Phase II" is already platted and is consistent with the County's comprehensive plan.

Step 2 Delineate with-bank wetland polygons: Please refer to the diagram at the end of this section labeled "Polygon Delineation". The complexity of this step in the exercise will depend upon the complexity of the landscape of the bank site, the with- and without-bank

scenarios and the mitigation plan. In this example, nine wetland polygons have been delineated on the bank site. The reasoning for the polygon breakout follows:

Polygon A1 (1.0 acre)

- Existing condition is upland pasture.
- Without-bank condition is residential lots.
- With-bank condition is herbaceous wetland restored from the existing pasture.

Polygon A2 (10.0 acres)

- Existing condition is herbaceous wetland with a reduced hydroperiod due to ditching.
- In the without-bank condition the wetland receives small direct impacts from filling for roads and lots. Secondary impacts are expected due to the shift in adjacent land use from pasture to residential.
- In the with-bank condition the hydroperiod is restored within the wetland itself and secondary benefits are expected from the shift of the adjacent land use from pasture to reforested upland.

Polygon A3 (4.0 acres)

- Existing condition is upland pasture.
- Without-bank condition is residential lots.
- With-bank condition is reforested wetland restored from the existing pasture.

Polygon A4 (8.0 acres)

- Existing condition is upland forest.
- Without-bank condition is residential lots.
- In the with-bank condition the vegetative composition shifts from upland to wetland forest.

Polygon A5 (12.0 acres)

- Existing condition is forested wetland with a reduced hydroperiod due to ditching.
- In the without-bank condition the wetland receives small direct impacts from filling for roads and lots. Secondary impacts are expected due to the shift in adjacent land use from pasture to residential.
- In the with-bank condition the hydroperiod is restored within the wetland itself and secondary benefits are expected from the shift of the adjacent land use from pasture to forested upland.

Polygon A6 (23.0 acres)

- Existing condition is undisturbed forested wetland.
- In the without-bank condition the wetland receives secondary impacts due to the shift in adjacent land use from undisturbed upland forest to residential.
- In the with-bank condition the expected secondary impacts due to the shift in adjacent land use are prevented.

Polygon A7 (40.0 acres)

- Existing condition is moderately disturbed forested wetland.
- In the without-bank condition the wetland is indirectly impacted due to the shift in adjacent land use from undisturbed upland forest to residential.
- In the with-bank condition the expected secondary impacts due to the shift in adjacent land use are prevented.

Polygon A8 (55.0 acres)

- Existing condition is undisturbed forested floodplain wetland.
- In the without-bank condition this wetland receives secondary impacts due to the shift in adjacent land use from undisturbed upland forest to residential.
- In the with-bank condition the expected secondary impacts due to the shift in adjacent land use are prevented.

Polygon A9 (25.0 acres)

- Existing condition is slightly forested floodplain.
- In the without-bank condition this wetland receives secondary impacts due to the shift in adjacent land use from upland pasture to residential.
- In the with-bank condition secondary benefits are expected from the shift of the adjacent land use from pasture to forested upland.

Please note that the delineation of Polygons A8 and A9 does not include the wetland area on the north side of the creek. Although this section of the wetland is located within the bank property and will be preserved, it is not expected to receive the above described secondary benefits. Determining where this cut-off should fall will depend upon topographic or vegetative breaks in the landscape and/or which function is most sensitive to change in the functional assessment used to generate the delta for the polygon.

(Note: For the sake of brevity, the direct impacts from the footprint of the ditch/berm have been ignored. This area could have been factored in as a separate polygon).

Step 3 Determine the wetland function weighting factors for each variable at the polygon level, if appropriate.

Assign the weighting factors for each of the wetland functions. The "default setting" is to assume each of the WRAP functions is equally important. In most situations however, the relative weighting of each function may be adjusted in light of public interest considerations. For Polygon A2 the following were considered in adjusting the weights:

Established Watershed Issues - Refer to the Crippled Creek Ecosystem Management Plan. (Note: this is a fictitious plan that is not included in the example)
The stated goals and objectives of the plan are:

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Increase the total spatial extent of natural areas.
Improve habitat and functional quality
Improve native plant and animal species abundance and diversity with special emphasis on threatened and/or endangered species.
Increase availability of freshwater for agricultural /municipal/industrial purposes
Reduce flood damages (agricultural/urban)
Provide recreational opportunities.
Protect cultural and archaeological resources and values.

One of the more specific actions identified in the plan is to establish buffer zones around the Crippled Creek Wildlife Preserve. This action item was included to address the goals of increasing the total spatial extent of natural areas, improving habitat and its functional quality, and improving native plant and animal species abundance and diversity. Also refer to Closing the Gaps in Floridas Wildlife Habitat Conservation System.

Benefits To Important Adjacent Lands - Establishment of the bank is expected to provide ecological benefit to the CCWP. The establishment of the bank would provide a buffer between the CCWP and the Creekview subdivision. The proposed long-term management plan for the bank is being developed in concert with the management practices of the CCWP. The effective increase in spatial extent of the CCWP will allow for more effective management.

Threatened and Endangered Species - Currently there is an active bald eagle nest on the CCWP. There is MBRT consensus that enhancement of the herbaceous wetland will provide an additional feeding site for the eagles.

Scarce Habitats : There are no habitats considered to be unusual, unique or rare in the region.

Refer to Section 5b for more detail regarding scoring calculations and descriptions.

WILDLIFE UTILIZATION (WU)

Established Watershed Issues (WI)=3. The Crippled Creek Management Plan contains elements to increase wildlife habitat.

Benefits to Important Adjacent Areas (AA)=3. Wildlife at the Crippled Creek Wildlife Refuge (CCWR) will benefit from the additional buffer/habitat created by the polygon.

Threatened or Endangered Species (T&E)=1. The polygon may attract (not increase population of) nearby nesting eagles by providing foraging habitat.

Scarce Habitats (SH)=0.

Special Considerations (SC)=0

VEGETATIVE OVERSTORY (VO)

Not Applicable: Currently the polygon is herbaceous and will remain herbaceous.

VEGETATIVE GROUNDCOVER (VG)

WI, AA, T&E, SH, and SC=0

ADJACENT BUFFERS (UPLANDS)(AB)

WI=3. The CCWR's management plan identifies the buffering of wetlands as necessary for wildlife utilization.

AA=0

T&E=1. Buffered wetlands are more likely to be used by eagles.

SH=0

SC=0

HYDROLOGY (HY)

WI=3. Increasing water storage capacity in isolated wetlands is identified as critical in the watershed management plan.

AA=3. Restoring hydrology will increase base flows to Crippled Creek.

T&E=1. Restored hydrology will increase the forage base for the eagle and woodstork.

SH=0

SC=0

WATER QUALITY (WQ)

WI=0. Water quality was not identified as a critical element in the watershed management plan.

AA=3. Backfilling the ditches will prevent direct discharge into the Crippled Creek.

T&E=0

SH=0

SC=0

Step 4 Run WRAP: For each of the wetland polygons, run the assessment for the existing conditions and the with- and without-bank scenarios. For the sake of brevity, only the scoring for polygon A2 is described below. A similar process should apply to the remaining polygons.

WRAP scoring for Polygon A2

a. Wildlife Utilization Variable (Section 2.2.1.2 of WRAP) -

- 1) Existing condition - There is evidence the wetland is utilized by small and medium-sized mammals and some aquatic macroinvertebrates and amphibians. There is also adequate protective cover for wildlife. The above descriptors fit the score of 2.0. However, the wetland is located within the pasture and is subject to human disturbances from the cattle operation. The wetland is also not contiguous to naturally-occurring vegetative communities. These descriptors best fit the score of 1.0. Therefore, assign a score of 1.5.
- 2) Without-bank condition - When considering the wetland itself, A2 still fits the calibration descriptions for the score of 2. The vegetative structure is still intact in the existing condition and, for the most part, will remain intact in the without-bank condition. However, when considering the expected increase in adverse secondary impacts due to the shift in adjacent land use from pasture to residential, A2 best fits the calibration descriptions for the score of 1.
- 3) With-bank condition - The hydroperiod of the wetland itself is immediately restored by backfilling the ditch. This should substantially improve habitat conditions for aquatic macroinvertebrates and amphibians and also allow for the return of small forage fishes. This fits with the 3.0 descriptor for macroinvertebrates, amphibians and forage fishes. In the near-term, however, the rest of the calibration descriptors fit better with a score of 2.0. On the other hand, once the adjacent reforested upland reaches maturity, most all the calibration descriptions will better fit the score of 3.0. However, due to the close proximity of Polygon A2 to the Creekview subdivision, the potential for human disturbances is not negligible and proper long-term management through fire will be hampered. Therefore, when considering with-bank scenario in the long-term, Polygon A2 fits best between the scores of 3.0 and 2.0. Therefore, go ahead and assign a score of 2.5 for Wildlife Utilization because the final score will be adjusted in step 4 to account for the temporal lag and risk associated with the rehabilitation of the adjacent forested system.

b. Vegetative Overstory/Shrub Canopy Variable (Section 2.2.2.2, WRAP)

1) Since this is a herbaceous wetland, the overstory and shrub component is not scored, therefore, not applicable.

c. Wetland Vegetative Ground Cover Variable (Section 2.2.3.2, WRAP)

1) Existing condition: Ground cover is primarily appropriate native species but there is encroachment of inappropriate species and exotics. There are periodic impacts due to cattle grazing in from the adjacent pasture. Assign a score of 1.5.

2) Without-bank conditions fit closely with the Existing condition score but the shift in adjacent land use from pasture to residential is likely to result in greater disturbance and an increase in nuisance or inappropriate species. Assign a score of 1.0.

3) With-bank conditions: Most of the calibration descriptions fit the score of 3.0. However, due to close proximity to the Creekview subdivision, proper long-term management through fire will be hampered. Assign a score of 2.5.

d. Adjacent Upland/Wetland Buffer Variable (Section 2.2.4.2 WRAP)

1) Existing conditions: The polygon is surrounded by upland pasture. The buffer is greater than 300 feet and is dominated by invasive exotic plant species. A score, therefore of 1.0

2) Without-bank conditions: Residential housing up to the wetland line, therefore, a score of 0.

3) With-bank conditions: Surrounding upland pasture will be restored to herbaceous wetland (polygon A1) and forested upland, with a greater than 300-foot buffer on three sides. A small portion of the east side of the wetland is close to an existing residential subdivision. A score of 2.5 is appropriate.

e. Field Indicators of Wetland Hydrology Variable (Section 2.2.5.2 WRAP)

1) Existing condition: Even with the ditch, the hydrologic regime is adequate to maintain a viable wetland system. However, plants are showing signs of stress and there is evidence of soil subsidence. Assign a score of 1.5.

2) Without-bank condition: The shift in adjacent land use from pasture to residential is expected to result in alterations of the contributing watershed. When considering these secondary impacts and ditched condition of the wetland, A2 best fits the calibration descriptions for the score of 1.

3) With-bank condition: The wetland hydroperiod is restored by backfilling the ditch and the contributing watershed is maintained. This fits best with most of the calibration descriptions for the score of 3.0.

f. Water Quality Inputs and Treatment Variable (Section 2.2.6.2 WRAP)

1) Existing condition:

Landuse Category (LU): The adjacent land use is rangeland. Assign a score of 2.5.
(Note: If Polygon A2 had more than one type of land use in its contributing watershed, the score would be assigned based on the relative contribution of each land use type. The formula for this type of situation is specified in the WRAP procedure).

Treatment Category (PT): There is no treatment of the runoff from the pasture so the score is 0.

The combined score for Water Quality Inputs and Treatment Parameter is
 $(2.5+0.0)/2=1.25$

2) Without-bank condition:

Landuse Category (LU) . The adjacent land use will be single-family residential. Assign a score of 1.5.

Treatment Category (PT). The residential subdivision would need an adequate treatment system. Assign a score of 2.5.

The combined score for Water Quality Inputs and Treatment Parameter is
 $(1.5+2.5)/2=2.0$

3) With-bank condition:

Landuse Category (LU). The score for the adjacent land use best fits with recreational/open space. Assign a score of 3.0.

Treatment Category (PT). The natural undeveloped area category best fits the forested condition expected in the with-bank scenario. Assign a score of 3.0.

The combined score for Water Quality Inputs and Treatment Parameter is
 $(3.0+3.0)/2=3.0$

Step 5 Determine the temporal lag factor: Please refer to section 5c.

In this example, polygon A2 is a herbaceous restoration effort; therefore, no temporal factor is required as the site will be restored within the 5-year credit release schedule. If the site was being restored as a forested system, a temporal lag factor would have been necessary due to the time required for the system to reach functional maturity.

Step 6 Run the calculations to get the total of potential credits for polygon A2.

POLYGON NO: A2 _____
 FLUCS CODE _____

POLYGON ACREAGE	10								
VARIABLE	WEIGHT	EXIST (A)	WITH (B)	WITHOUT (C)	DELTA (A - C)	DELTA (B - C)	TEMP	ADJ (A - C)	ADJ (B - C)
WU	0.268	1.500	2.500	1.000	0.167	0.500	1.0000	0.045	0.134
VO	NA	NA	NA	NA	0.000	0.000	NA	0.000	0.000
VG	0.100	1.500	2.500	1.000	0.167	0.500	1.0000	0.017	0.050
AB	0.196	1.000	2.500	0.000	0.333	0.833	1.0000	0.065	0.163
HY	0.286	1.500	3.000	1.000	0.167	0.667	1.0000	0.048	0.191
WQ	0.172	1.250	3.000	2.000	-0.250	0.333	1.0000	-0.043	0.057
SUM	1.022							0.131	0.595
TOTAL CREDITS: B-C	5.953								
PRESERVATION CREDITS: A-C	1.313								
CREDIT BALANCE	4.640								

NOTE: Copies of the spread sheets that will do the required calculations are available in Excel from the Corps of Engineers.

Calculations:

- 1) The weighting factor, and temporal correction factor, if appropriate, are inserted into the table.
- 2) Existing, With-and Without-bank scores are calculated by dividing the raw WRAP score by 3 for each variable, which yields a percentage. FOR EXAMPLE, for WU, Existing (A) is $1.5/3=0.5$; Without (C) is $1.0/3=.333$; therefore, the delta A-C $=0.167$ ($0.5-.333=0.167$). Repeat this procedure for the other variables and calculate the deltas for A-C.
- 3) The difference between Existing and Without (A-C) multiplied by the weighting factor previously calculated yields the Adj Delta (A-C). The acreage of the polygon multiplied by the sum of the variables for the Adj. Deltas (A-C) yields Preservation Credits that may be released up front. For this example, the Preservation Credits are 1.313 (10 acres x 0.131=1.31 Preservation Credits).
- 4) The difference between With and Without (B-C) multiplied by the weighting factor previously calculated, and the temporary Correction factor, if appropriate for each variable, yields the Adj Delta (B-C). The acreage of the polygon multiplied by the sum of the variables for the Adj. Deltas (B-C) yields the total number of credits available for the bank. For this example, the number is 5.95 (10 acres x 0.595=5.95).
- 5) The difference between the Total Credits and Preservation Credits (Credit Balance) equals the credits remaining in the bank to distribute through the credit release schedule. For this example, the number of credits available are 4.64.

Step 7 Combine the scores from all polygons as calculated from Step 6 in the following table. For this example, we only determined the score for polygon A2. It will be necessary for the banker to similarly calculate individual scores for each wetland polygon or groups of similar polygons and include as in the table.

SUMMATION OF WETLAND POLYGONS			
POLYGON NO.	TOTAL CREDITS	PRESERVATION CREDITS	CREDIT BALANCE
A1			
A2	5.95	1.31	4.64
A3			
A4			
A6			
A7			
A8			
A9			
SUM			

Step 8 The last step is to break down by habitat type the number of credits available for each wetland type. For example, there are X credits available for herbaceous wetlands, and X credits available for forested wetlands. Except under exceptional circumstances, as determined by the MBRT, mitigation will be in-kind. For example, if the impacted wetland is a forested system, only forested wetland credits may be purchased from the bank.

Step 9 Credit Release Schedule.

There should be no concrete, precalculated credit schedule, such as 15 percent per year for five years. A conceptual schedule should be submitted in the MBI with the following components:

- Conservation Easement/Property Transfer: Specified number of credits (Preservation Credits).

- **Post Construction:** Specified number of credits available for release as determined by successful completion of construction activities (or initial exotic removal).
- **Monitoring:** Number of credits available for release as determined by success criteria attainment (Year 1, Year 2, Year 3, etc.). These credits cannot be accurately predetermined. The majority of credits should be held back for potential release during the progressive stages of this release schedule component, as it measures the true natural resource restoration as it occurs.

Goals and objectives to meet success are generally described in the variable descriptors in WRAP, and success criteria should quantify these descriptors whenever possible. The success criteria and measures should be designed around applicable WRAP descriptors in order to justify the ecological lift of the WRAP deltas. When possible, an optimally-functioning reference wetland should be selected and used as a model for success.

The Florida MBRT believes that it is appropriate to permit flexibility to develop, with the banker, specific credit release criteria. The team has outlined the general criteria to aid in developing a credit release schedule.

Credit Release Example

Polygon A2 from Creekview Example: Total Credits = 5.95

1) Upfront Credit Release

Existing-Condition Credits (A) minus Without-Bank credits (C) = 1.313

2) Completion of Construction Credit Release

Based on immediate increase in WRAP variable scores for (1) backfilling of the ditch and (2) initial nuisance and exotic vegetation eradication in the wetland and adjacent buffer (upland and wetland). Must be documented (this will be baseline conditions).

3) Credit Release based on Success Criteria Monitoring

Wildlife Utilization Variable: 1.5 (existing cond.) to 2.5 (with bank)

Increased hydroperiod will support forage fish, more aquatic inverts and amphibians.

Hydrological monitoring must measure and substantiate increases in hydroperiod.

Wildlife surveys must substantiate increases in specific wildlife guilds (refer to WRAP Addendum: Florida Wildlife Guilds)

Adjacent upland pasture will be restored to upland forest.

Vegetative monitoring must substantiate increases in cover, habitat, and food sources for wildlife in adjacent uplands (as well as the wetland).

Wildlife surveys must substantiate an expansion of the food chain and an increase in wetland wildlife utilization due to adjacent upland influences.

Vegetative Overstory Variable: Not applicable in this wetland.

Vegetative Ground Cover Variable: 1.5 (existing cond.) to 2.5 (with bank)

Vegetative monitoring must substantiate reductions in undesirable species. To fulfill success criteria, there must be less than 10% nuisance and inappropriate plant species and no exotic plant species. This nuisance and exotic success criteria may have been already met and credits released in the construction completion phase.

A decrease in impacts from cattle grazing must be substantiated.

Vegetative coverage in the ditch footprint must be documented.

Adjacent Buffer Variable: 1.0 (existing cond.) to 2.5 (with bank)

Vegetative monitoring must substantiate the successful transition of surrounding upland pasture to quality herbaceous wetland and forested upland, both containing less than 10% nuisance and no exotic plant species.

Wetland Hydrology Variable: 1.5 (existing cond.) to 3.0 (with bank)

Documentation of removal of physical features or conditions impairing hydrologic function. This activity normally would justify credit release in the construction completion phase.

Hydrologic measurements must substantiate a transition to natural hydroperiod. This includes documentation of beneficial increases (or decreases) in water depth, duration (hydroperiod), and frequency (hydropattern) when applicable. Surface water flow pattern documentation should be provided.

Vegetative monitoring must substantiate any transition to a healthy plant community with no stress resulting from an improper hydroperiod.

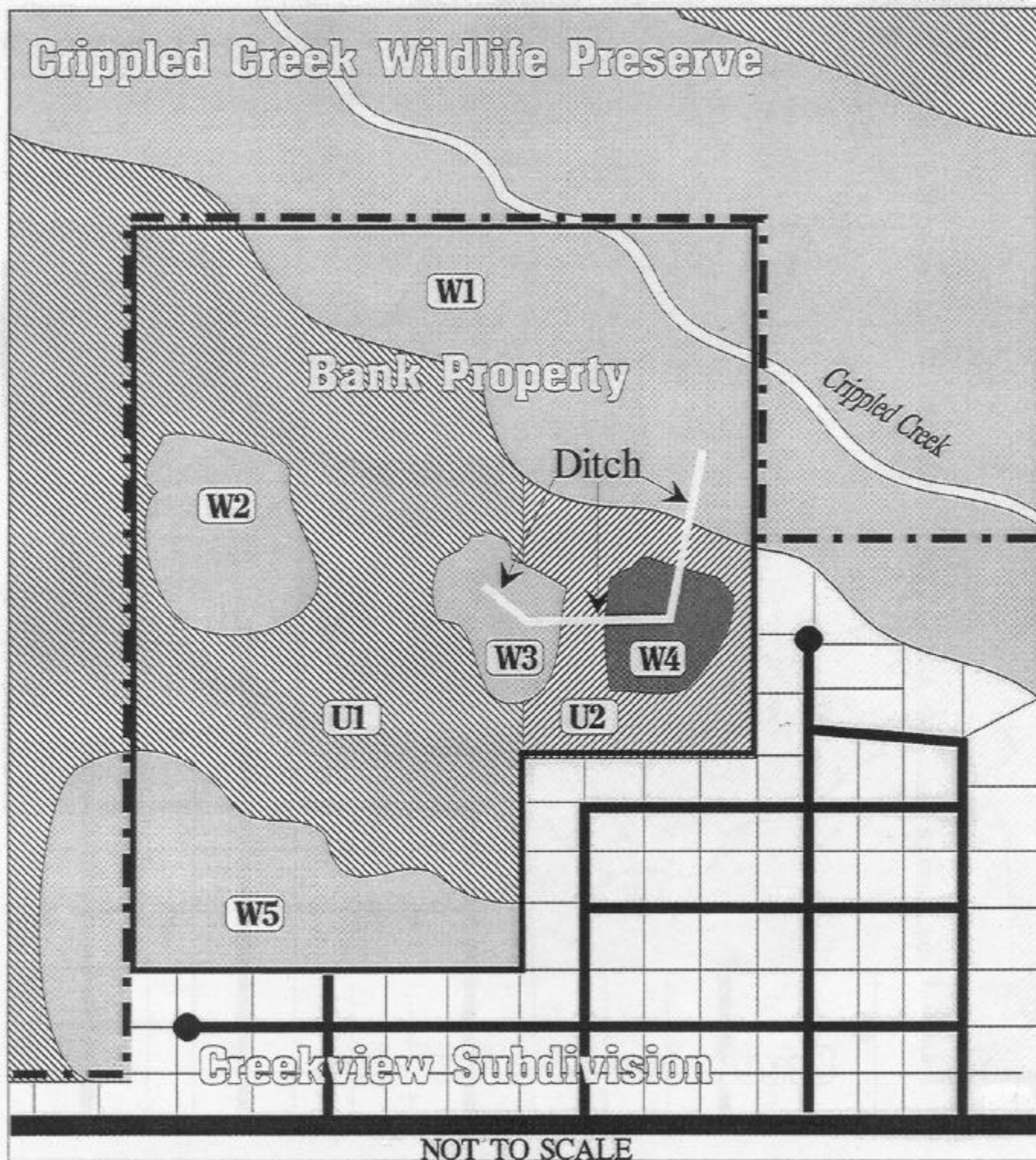
Water Quality Variable: 1.25 (existing cond.) to 3.0 (with bank)

Vegetative monitoring must substantiate the Land Use Category transition from rangeland to natural systems (and subsequently Pre-treatment Category change).

Hydrological documentation must support Pre-treatment Category inputs.

Water quality sampling and analysis is required for baseline documentation. Analysis must substantiate water quality improvement as implied by WRAP input and treatment category changes in order for credits to be released. Refer to WRAP Addendum: Water Quality Indicators.

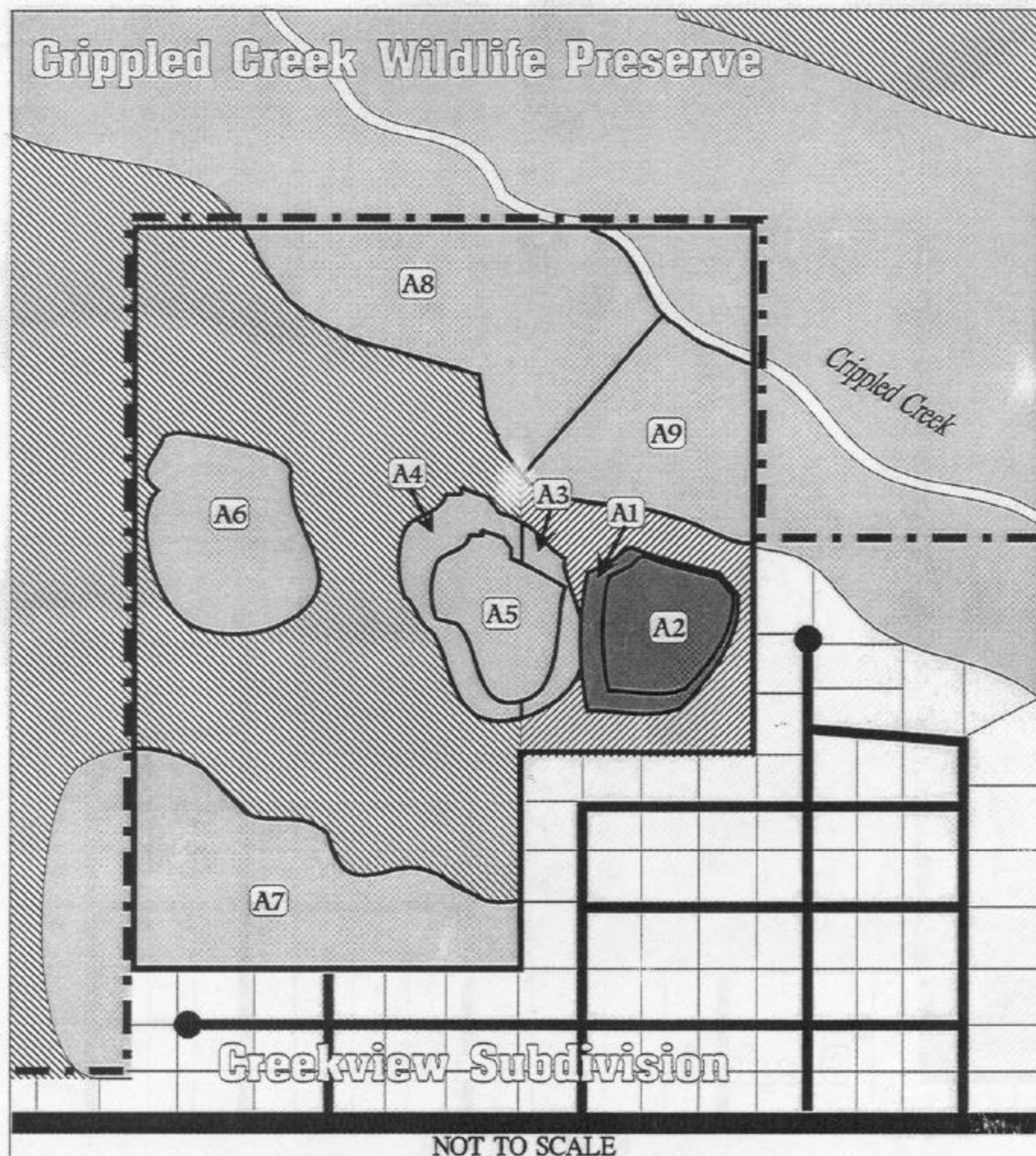
Crippled Creek Wildlife Preserve



- | | |
|-----------------------------|---------------------------------|
| — Bank Property Line | - - - Preserve Boundary |
| Forested Wetland | Forested Upland |
| Herbaceous Wetland | Upland Pasture |
| Residential Lot | W5 Wetland/Upland Number |

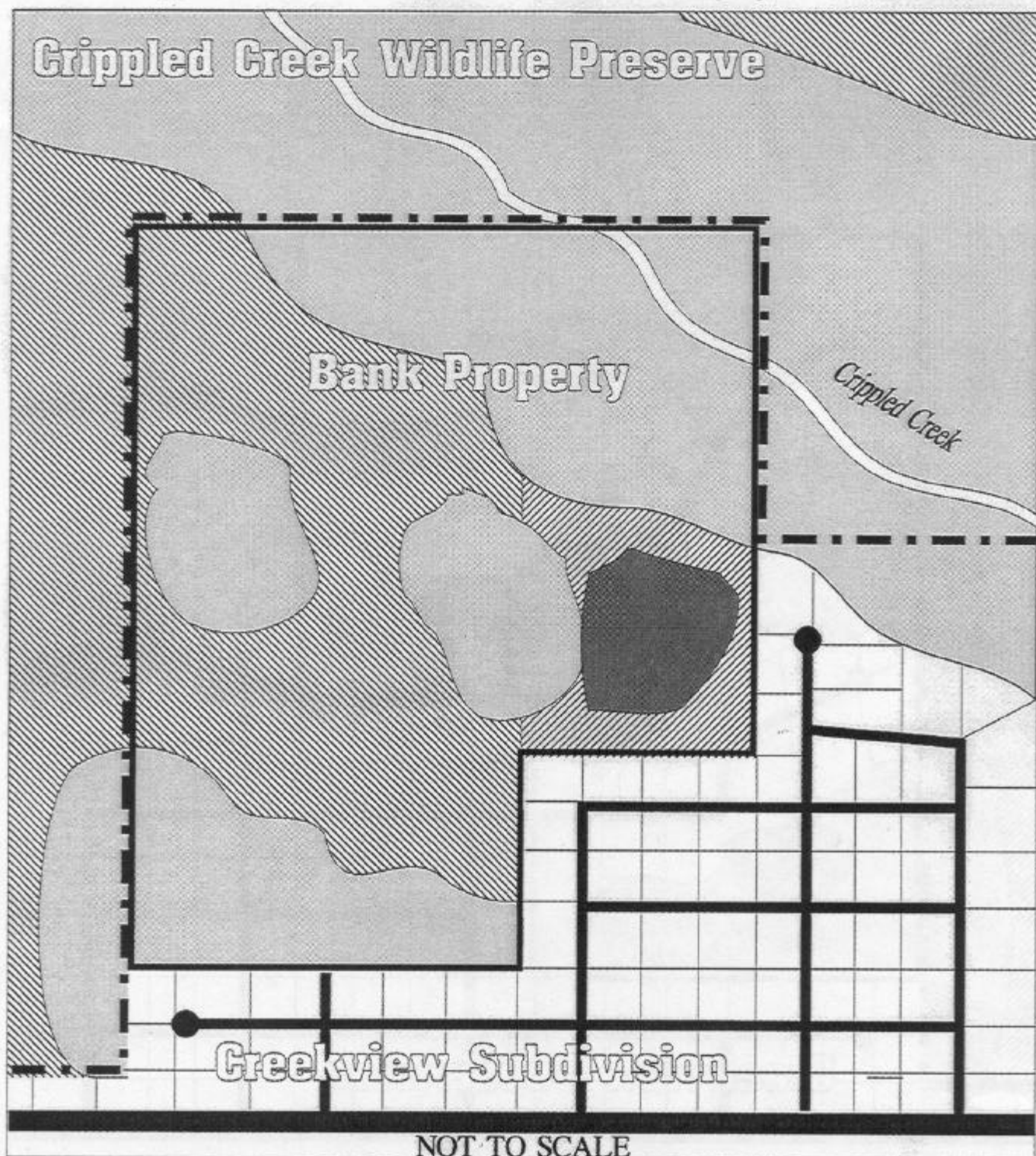
Existing Conditions

Crippled Creek Wildlife Preserve



- | | |
|----------------------|-------------------------|
| — Bank Property Line | - - - Preserve Boundary |
| Forested Wetland | Forested Upland |
| Herbaceous Wetland | Reforested Upland |
| Residential Lot | A1 Polygon Number |

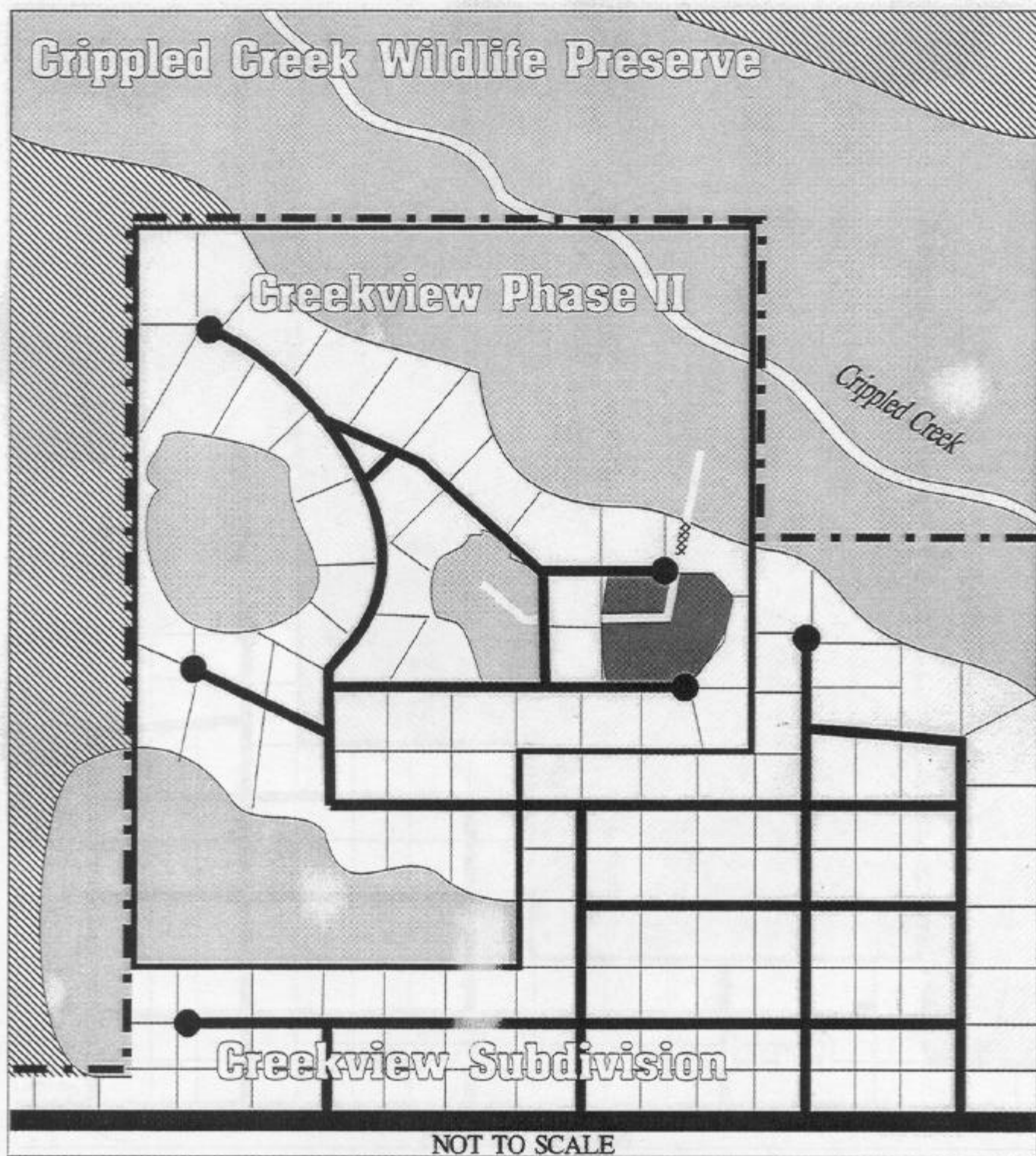
Polygon Delineation



- | | |
|----------------------|-------------------------|
| — Bank Property Line | - - - Preserve Boundary |
| □ Forested Wetland | ▨ Forested Upland |
| ■ Herbaceous Wetland | ▩ Reforested Upland |
| □ Residential Lot | |

With Bank

Crippled Creek Wildlife Preserve



- | | |
|----------------------|-------------------------|
| — Bank Property Line | - - - Preserve Boundary |
| Forested Wetland | Forested Upland |
| Herbaceous Wetland | Residential Lot |

Without Bank

IMPACT SITE EXAMPLE

The following stepwise example uses the same formula described in Section 5. The narrative descriptions for existing conditions are brief. For an actual project, sufficient information should be provided to thoroughly assess the functions of the wetlands that will be affected by the project. For this example, the proximity factor (Px) is not included in the calculations.

Existing Conditions at the project site (refer to the “without project” illustration at the end of this section):

The project site (20 acres) is a mixture of longleaf pine/wire grass upland community and two isolated wetland systems (Wetland Polygon 1 is 3 acres and Wetland Polygon 2 is 10 acres). Neither wetland is severely degraded. Wetland 1 is a herbaceous marsh and Wetland 2 is a cypress dome, intermixed with black gum.

The site is bounded on three sides by undeveloped property; the remaining side is single-family residential. With reference to the undeveloped land, one-third is in improved pasture, and two-thirds is a designated wildlife management area.

Project Plans (refer to the “with project” illustration at the end of this section):

The applicant proposes to construct a retail store with attendant facilities, such as parking, a stormwater retention pond and warehouse. The applicant proposes to fill the herbaceous marsh for a warehouse and three of the 10 acres of the cypress dome for the retail store. The remaining seven acres of the cypress dome will be preserved. Most of the surrounding upland habitat will be converted into parking. The stormwater pond will be excavated from uplands.

Step 1

The applicant should delineate the wetland polygons on an aerial photograph/map and determine the acreage for each wetland. Polygons of similar habitats and condition could be grouped together in order to compute WRAP more quickly. In this example, the two wetlands are dissimilar; therefore, WRAP will be done for both wetlands.

Step 2

Once the wetlands have been delineated, the next step is to verify and describe the wetlands. This step may be combined with the WRAP analysis.

Step 3

Before performing WRAP, however, the weighting factors should be calculated for each variable for each wetland polygon or group of polygons. For this example, the WRAP variables were

determined to be of equal weight; therefore, the assigned and minimum weights are the same (refer to Section 5b).

Step 4

Run WRAP. For each wetland polygon or group of polygons, run the assessment for “without” and “with” project. It will be necessary when assessing the “with” project scenario to delineate additional polygons because of project impacts. For this example, the “without” project has two wetland polygons, and the “with” project has three polygons.

WRAP score for Polygon 1

1) Wildlife Utilization

Without Project: There is optimal representation of species guilds, with evidence of large mammals. There is negligible evidence of human disturbance. The surrounding upland habitat was logged historically, but there has been successful natural longleaf pine regeneration. The score is 3.

With Project: The wetland will be filled for the warehouse. The score is 0.

2) Wetland Overstory/Shrub Canopy of Desirable Species.

The wetland is herbaceous; therefore, the variable is not applicable (NA).

3) Wetland Vegetative Ground Cover of Desirable Species.

Without Project: The wetland has minimal human disturbance and less than 10 percent nuisance/inappropriate plant species. The score is 3.

With Project: The wetland will be filled. The score is 0.

4) Adjacent Upland Buffer

Without Project: The upland habitat is in native longleaf pine/wiregrass. The site has been timbered in the past, but longleaf pine has naturally regenerated. This wetland, however, does not have a 300-foot-wide buffer surrounding it. A third of the buffer is about 50 feet wide on the west side and is adjacent to the residential community. The remaining uplands are longleaf pine/wiregrass. The score is 2.64 (66% scores 3 and 33% scores 2; therefore, $.66 \times 3 = 1.98$; $.33 \times 2 = .66$; $1.98 + .66 = 2.64$)

With Project: The wetland will be filled; therefore, the upland buffer is inconsequential. The score is 0.

5) Field Indicators of Wetland Hydrology

Without Project: The isolated wetland has not been drained. There is no ground water influence, hydrology is a result of unimpeded surficial water. The score is 3.

With Project: The entire wetland will be filled. The score is 0.

6) Water Quality Input and Treatment

Without Project: Under Land Use Category: The surrounding habitat is natural longleaf pine/wiregrass system. The score is 3.

Under Pre-Treatment Category: The descriptor of "natural undeveloped area fits a score of 3. The final score is $3+3/2=3$.

With Project: The site will be filled, therefore, the score is 0.

WRAP Score for Polygon 2

Note: As a result of the fill, it was necessary to split polygon 2 into two polygons, 2a which will be preserved and 2b which will be filled. However, the original polygon 2 should be evaluated in total for "without" project. The new polygon delineations are only used for "with" project evaluation. Even though polygon 2a will not be directly impacted by placement of fill, there will be indirect and secondary impacts associated with the fill in polygon 2b. These impacts will be expressed in the WRAP analysis, and will require mitigation.

1) Wildlife Utilization Matrix

Without Project: The cypress dome, other than being timbered in the past, probably in the late 40's, is in very good shape. There is evidence of deer use inside the wetland, and several raptor nests were observed in the taller cypress trees. The score is 3.

With Project: While the applicant will preserve the seven acres (polygon 2a), the score of this wetland decreases because of the adjacent impacts. A score of 1.5 based on the associated human disturbance. Polygon 2b will be filled; therefore, the score is 0.

2) Wetland Overstory/Shrub Canopy of Desirable Species

Without Project: The wetland has not been drained or otherwise disturbed. The cypress had been timbered from the wetland, but as a result of natural regeneration, the cypress have returned. There is good mid-canopy structure.

The score is 3.

With Project: Polygon 2a will be preserved, and should remain in its present condition. While the size of the polygon is less, the vegetative structure should not be affected by the project. A score of 3 is assigned. Polygon 2b will be filled; therefore, the score is 0.

3) Wetland Vegetation Ground Cover of Desirable Species

Without Project: Polygon 2 will remain unaltered, a score of 3 is assigned.

With Project: We anticipate a similar response as described in the overstory variable. A score of 3 is assigned to polygon 2a. Polygon 2b will be filled; therefore, the score assigned is 0.

4) Adjacent Upland/Wetland Buffer

Without Project: There is a 300-foot buffer of longleaf pine/wiregrass plant community. A score of 3 is assigned.

With Project: The buffer adjacent to polygon 2a will be severely altered as a result of the project. Three-quarters of the wetland is surrounded by an adjacent upland buffer, greater than 30 feet but less than 300 feet. However, the west side has no buffer. Therefore, the score is 1.5. Polygon 2b is filled; therefore, the score is 0.

5) Field Indicators of Wetland Hydrology

Without Project: The wetland has not been affected by drainage or other work that would affect the hydroperiod. A score of 3 is assigned.

With Project: The applicant is not proposing to use polygon 2a as part of the stormwater management system; however, surficial flow from the uplands will be affected as a result of the project. We anticipate a shortened hydroperiod. A score of 2 is assigned. Polygon 2b will be filled; therefore, the score is 0.

6) Water Quality Input and Treatment

Without Project: Under Land Use Category, the uplands surrounding this wetland are open space/natural undeveloped areas, a score of 3 is assigned. Under Pre-Treatment, natural undeveloped area scores a 3; therefore, the final score is $3+3/2=3$.

With Project: Under Land Use Category, moderate intensity commercial is

appropriate; therefore a score of 1.5 is assigned. Under Pre-Treatment, berms which prevent run-off from entering the wetland scores a 2.5. The final score is $1.5 + 2.5/2 = 2$ for polygon 2a. Since polygon 2b will be filled, this variable score drops to 0.

Document the WRAP scores and the basis for the scores for “without” and “with” project.

OLYGON NUMBER	WU			VO			VG			AB			HY			WQ		
	W	w/o	D	w	w/o	D	W	w/o	D	w	w/o	D	w	w/o	D	w	w/o	D
P1	0.00	3.00	-1.00	na	na	0.000	0.00	3.00	-1.00	0.00	2.64	-0.88	0.00	3.00	-1.00	0.00	3.00	-1.00
P2a	1.50	3.00	-0.50	3.00	3.00	0.000	3.00	3.00	0.000	1.50	3.00	-0.50	2.00	3.00	-0.333	2.00	3.00	-0.33
P2b	0.00	3.00	-1.00	0.00	3.00	-1.00	0.00	3.00	-1.00	0.00	3.00	-1.00	0.00	3.00	-1.00	0.00	3.00	-1.00
			0.000			0.000			0.000			0.000			0.000			0.000
			0.000			0.000			0.000			0.000			0.000			0.000
			0.000			0.000			0.000			0.000			0.000			0.000
			0.000			0.000			0.000			0.000			0.000			0.000
			0.000			0.000			0.000			0.000			0.000			0.000
			0.000			0.000			0.000			0.000			0.000			0.000

WU = Wildlife Utilization

VO = Vegetation-Overstory

VG = Vegetation-Ground Cover

AB = Adjacent Upland/Wetland Buffer

HY = Hydrology

WQ = Water Quality

D = Raw Delta

Step 5

Calculate the Raw and Adjusted (Adj) Delta for each variable for each polygon(s).

POLYGON NO. P1

POLYGON ACREAGE 3

FUNCTIONAL UNITS LOST -2.93

WRAP VARIABLE	RAW DELTA	WT. FACTOR	ADJ. DELTA
WU	-1.000	0.200	-0.200
VO	na	na	0.000
VG	-1.000	0.200	-0.200
AB	-0.880	0.200	-0.176
HY	-1.000	0.200	-0.200
WQ	-1.000	0.200	-0.200
SUM			-0.976

* The Raw Delta is calculated by dividing "without" and "with" project scores individually by 3, (yielding a percentage), and then subtracting the "without" percentage from "with" percentage. For example, for WU, the "with" score is $0/3.0=0$, the "without" score is $3/3=1$, thus $0-1=-1$ for the Raw Delta. Multiply the Calculated Raw Delta by the weighting factor, if appropriate, to yield the Adj. Delta. Remember, no weighting (equal weighting) was used for the impact site, so $1.0/5$ (variables) equals $.2$. If all six WRAP variables were used, the weighting factor for each would be $1.0/6=.167$. Alternatively, use the straight WRAP sum and average scoring methodology (when no weighting is involved) as described in WRAP section 2.2.

** Multiply the sum of Adj. Deltas by the acreage of the polygon(s) to yield functional units lost as a result of the project (debits). In this example, for polygon 1, the functional units lost equal -2.93.

POLYGON NO. P2a

POLYGON ACREAGE 7

FUNCTIONAL UNITS LOST -1.93

WRAP VARIABLE	RAW DELTA	WT. FACTOR	ADJ. DELTA
WU	-0.500	0.166	-0.083
VO	0.000	0.166	0.000
VG	0.000	0.166	0.000
AB	-0.500	0.166	-0.083
HY	-0.330	0.166	-0.055
WQ	-0.330	0.166	-0.055
SUM			-0.276

POLYGON NO. P2bPOLYGON ACREAGE 3FUNCTIONAL UNITS LOST -2.99

WRAP VARIABLE	RAW DELTA	WT. FACTOR	ADJ. DELTA
WU	-1.000	0.166	-0.166
VO	-1.000	0.166	-0.166
VG	-1.000	0.166	-0.166
AB	-1.000	0.166	-0.166
HY	-1.000	0.166	-0.166
WQ	-1.000	0.166	-0.166
SUM			-0.996

For this example, the summation of the all the polygon functional units that will require mitigation equals -7.85 (-2.93 herbaceous and -4.92 forested).

NOTE:

For this example, to mitigate for the wetland loss (-7.85 functional units), it will be necessary to purchase an equal number of functional units by habitat type plus additional functional units based on a calculated proximity factor, if necessary, from an approved mitigation bank. The exchange would be expressed as:

$$(\Delta \text{lift})(\text{acres})(T^*) = \text{credits} \Leftrightarrow \text{debits} = (\Delta \text{loss})(\text{acres})(P_x^{**})$$

* Temporal factor, if necessary

** Proximity factor, if necessary

Wildlife Management Area

Project Site - Retail Store









Subdivision

P2

P1

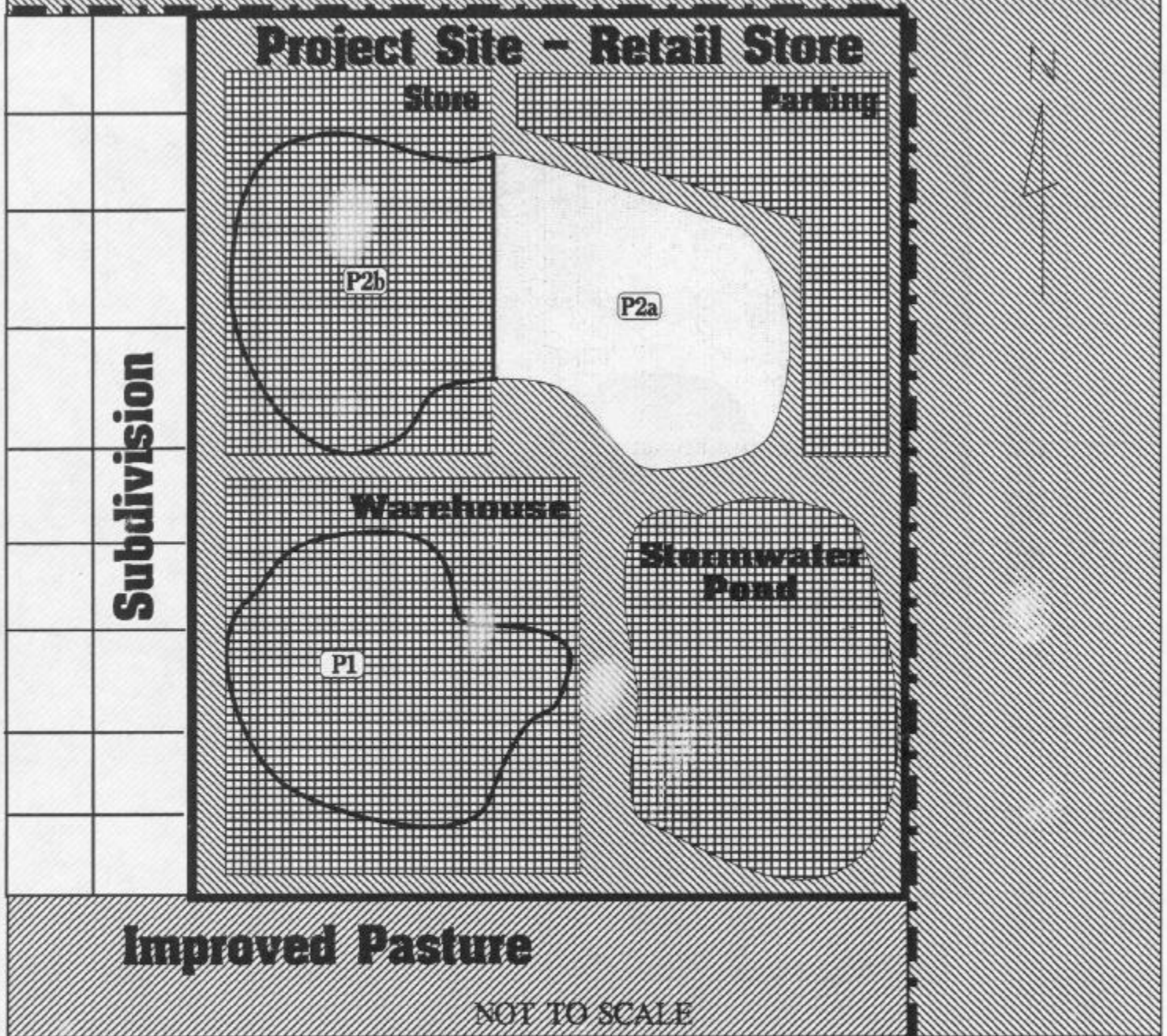
Improved Pasture

NOT TO SCALE

- | | |
|--|---|
|  Property Line |  Preserve Boundary |
|  Forested Wetland |  Forested Upland |
|  Herbaceous Wetland |  Upland Pasture |
|  Residential |  Polygon Number |

Without Project

Wildlife Management Area



— Property Line (P1) Polygon Number - - - WMA Boundary



Forested Wetland

Herbaceous Wetland

Residential



Forested Upland

Upland Pasture

Development Footprint

With Project

Appendix A - Federal Guidance for the Establishment, Use, and Operation of Mitigation Banks

DEPARTMENT OF DEFENSE
Department of the Army, Corps of Engineers
ENVIRONMENTAL PROTECTION AGENCY
DEPARTMENT OF AGRICULTURE
Natural Resources Conservation Service
DEPARTMENT OF THE INTERIOR
Fish and Wildlife Service
DEPARTMENT OF COMMERCE
National Oceanic and Atmospheric Administration

Federal Guidance for the Establishment, Use and Operation of Mitigation Banks

AGENCIES: Corps of Engineers, Department of Army, DOD; Environmental Protection Agency; Natural Resources Conservation Service, Agriculture; Fish and Wildlife Service, Interior; and National Marine Fisheries Service, National Oceanic and Atmospheric Administration, Commerce.

ACTION: Notice

SUMMARY: The Army Corps of Engineers (Corps), Environmental Protection Agency (EPA), National Resources Conservation Service (NRCS), Fish and Wildlife Service (FWS) and National Marine Fisheries Service (NMFS) are issuing final policy guidance regarding the establishment, use and operation of mitigation banks for the purpose of providing compensation for adverse impacts to wetlands and other aquatic resources. The purpose of this guidance is to clarify the manner in which mitigation banks may be used to satisfy mitigation requirements of the Clean Water Act (CWA) Section 404 permit program and the wetland conservation provisions of the Food Security Act (FSA) (i.e., "Swampbuster" provisions). Recognizing the potential benefits mitigation banking offers for streamlining the permit evaluation process and providing more effective mitigation for authorized impacts to wetlands, the agencies encourage the establishment and appropriate use of mitigation banks in the Section 404 and "Swampbuster" programs.

DATES: The effective date of this Memorandum to the Field is December 28, 1995.

FOR FURTHER INFORMATION CONTACT: Mr. Jack Chowning (Corps) at (202) 761-[[Page 58606]] 1781; Mr. Thomas Kelsch (EPA) at (202) 260-8795; Ms. Sandra Byrd (NRCS) at (202) 690-3501; Mr. Mark Miller (FWS) at (703) 358-2183; Ms. Susan-Marie Stedman (NMFS) at (301) 713-2325.

SUPPLEMENTARY INFORMATION: Mitigating the environmental impacts of necessary development actions on the Nation's wetlands and other aquatic resources is a central premise of Federal wetlands programs. The CWA Section 404 permit program relies on the use of compensatory mitigation to offset unavoidable damage to wetlands and other aquatic resources through, for example, the restoration or creation of wetlands. Under the "Swampbuster" provisions of the FSA, farmers are required to provide mitigation to offset certain conversions of wetlands for agricultural purposes in order to maintain their program eligibility.

Mitigation banking has been defined as wetland restoration, creation, enhancement, and in exceptional circumstances, preservation undertaken expressly for the purpose of compensating for unavoidable wetland losses in advance of development actions, when such compensation cannot be achieved at the

development site or would not be as environmentally beneficial. It typically involves the consolidation of small, fragmented wetland mitigation projects into one large contiguous site. Units of restored, created, enhanced or preserved wetlands are expressed as "credits" which may subsequently be withdrawn to offset "debits" incurred at a project development site.

Ideally, mitigation banks are constructed and functioning in advance of development impacts, and are seen as a way of reducing uncertainty in the CWA Section 404 permit program or the FSA "Swampbuster" program by having established compensatory mitigation credit available to an applicant. By consolidating compensation requirements, banks can more effectively replace lost wetland functions within a watershed, as well as provide economies of scale relating to the planning, implementation, monitoring and management of mitigation projects.

On August 23, 1993, the Clinton Administration released a comprehensive package of improvements to Federal wetlands programs which included support for the use of mitigation banks. At that same time, EPA and the Department of the Army issued interim guidance clarifying the role of mitigation banks in the Section 404 permit program and providing general guidelines for their establishment and use. In that document it was acknowledged that additional guidance would be developed, as necessary, following completion of the first phase of the Corps Institute for Water Resources national study on mitigation banking.

The Corps, EPA, NRCS, FWS and NMFS provided notice [60 FR 12286; March 6, 1995] of a proposed guidance on the policy of the Federal government regarding the establishment, use and operation of mitigation banks. The proposed guidance was based, in part, on the experiences to date with mitigation banking, as well as other environmental, economic and institutional issues identified through the Corps national study. Over 130 comments were received on the proposed guidance. The final guidance is based on full and thorough consideration of the public comments received.

A majority of the letters received supported the proposed guidance in general, but suggested modifications to one or more parts of the proposal. In response to these comments, several changes have been made to further clarify the provisions and make other modifications, as necessary, to ensure effective establishment and use of mitigation banks. One key issue on which the agencies received numerous comments focused on the timing of credit withdrawal. In order to provide additional clarification of the changes made to the final guidance in response to comments, the agencies wish to emphasize that it is our intent to ensure that decisions to allow credits to be withdrawn from a mitigation bank in advance of bank maturity be made on a case-by-case basis to best reflect the particular ecological and economic circumstances of each bank. The percentage of advance credits permitted for a particular bank may be higher or lower than the 15 percent example included in the proposed guidance. The final guidance is being revised to eliminate the reference to a specific percentage in order to provide needed flexibility. Copies of the comments and the agencies' response to significant comments are available for public review. Interested parties should contact the agency representatives for additional information.

This guidance does not change the substantive requirements of the Section 404 permit program or the FSA "Swampbuster" program. Rather, it interprets and provides internal guidance and procedures to the agency field personnel for the establishment, use and operation of mitigation banks consistent with existing regulations and policies of each program. The policies set out in this document are not final agency action, but are intended solely as guidance. The guidance is not intended, nor can it be relied upon, to create any rights enforceable by any party in litigation with the United States. The guidance does not establish or affect legal rights or obligations, establish a binding norm on any party and it is not finally determinative of the issues addressed. Any regulatory decisions made by the agencies in any particular matter addressed by this guidance will be made by applying the governing law and regulations to the relevant facts. The purpose of

the document is to provide policy and technical guidance to encourage the effective use of mitigation banks as a means of compensating for the authorized loss of wetlands and other aquatic resources.

John H. Zirschky, Acting Assistant Secretary (Civil Works), Department of the Army.
Robert Perciasepe, Assistant Administrator for Water, Environmental Protection Agency.
James R. Lyons, Assistant Secretary, Natural Resources and Environment, Department of Agriculture.
George T. Frampton, Jr., Assistant Secretary for Fish and Wildlife and Parks, Department of the Interior.
Douglas K. Hall, Assistant Secretary for Oceans and Atmosphere, Department of Commerce.

MEMORANDUM TO THE FIELD

SUBJECT: Federal Guidance for the Establishment, Use and Operation of Mitigation Banks

I. Introduction

A. Purpose and Scope of Guidance

This document provides policy guidance for the establishment, use and operation of mitigation banks for the purpose of providing compensatory mitigation for authorized adverse impacts to wetlands and other aquatic resources. This guidance is provided expressly to assist Federal personnel, bank sponsors, and others in meeting the requirements of Section 404 of the Clean Water Act (CWA), Section 10 of the Rivers and Harbors Act, the wetland conservation provisions of the Food Security Act (FS) (i.e., "Swampbuster"), and other applicable Federal statutes and regulations. The policies and procedures discussed herein are consistent with current requirements of the Section 10/404 regulatory program and "Swampbuster" provisions and are intended only to clarify the applicability of existing requirements to mitigation banking. **[[Page 58607]]**

The policies and procedures discussed herein are applicable to the establishment, use and operation of public mitigation banks, as well as privately-sponsored mitigation banks, including third party banks (e.g., entrepreneurial banks).

B. Background

For purposes of this guidance, mitigation banking means the restoration, creation, enhancement and, in exceptional circumstances, preservation of wetlands and/or other aquatic resources expressly for the purpose of providing compensatory mitigation in advance of authorized impacts to similar resources.

The objective of a mitigation bank is to provide for the replacement of the chemical, physical and biological functions of wetlands and other aquatic resources which are lost as a result of authorized impacts. Using appropriate methods, the newly established functions are quantified as mitigation "credits" which are available for use by the bank sponsor or by other parties to compensate for adverse impacts (i.e., "debits"). Consistent with mitigation policies established under the Council on Environmental Quality Implementing Regulations (CEQ regulations) (40 CFR Part 1508.20), and the Section 404(b)(1) Guidelines (Guidelines) (40 CFR Part 230), the use of credits may only be authorized for purposes of complying with Section 10/404 when adverse impacts are unavoidable. In addition, for both the Section 10/404 and "Swampbuster" programs, credits may only be authorized when on-site compensation is either not practicable or use of a

mitigation bank is environmentally preferable to on-site compensation. Prospective bank sponsors should not construe or anticipate participation in the establishment of a mitigation bank as ultimate authorization for specific projects, as excepting such projects from any applicable requirements, or as preauthorizing the use of credits from that bank for any particular project.

Mitigation banks provide greater flexibility to applicants needing to comply with mitigation requirements and can have several advantages over individual mitigation projects, some of which are listed below:

1. It may be more advantageous for maintaining the integrity of the aquatic ecosystem to consolidate compensatory mitigation into a single large parcel or contiguous parcels when ecologically appropriate;
2. Establishment of a mitigation bank can bring together financial resources, planning and scientific expertise not practicable to many project-specific compensatory mitigation proposals. This consolidation of resources can increase the potential for the establishment and long-term management of successful mitigation that maximizes opportunities for contributing to biodiversity and/or watershed function;
3. Use of mitigation banks may reduce permit processing times and provide more cost-effective compensatory mitigation opportunities for projects that qualify;
4. Compensatory mitigation is typically implemented and functioning in advance of project impacts, thereby reducing temporal losses of aquatic functions and uncertainty over whether the mitigation will be successful in offsetting project impacts;
5. Consolidation of compensatory mitigation within a mitigation bank increases the efficiency of limited agency resources in the review and compliance monitoring of mitigation projects, and thus improves the reliability of efforts to restore, create or enhance wetlands for mitigation purposes.
6. The existence of mitigation banks can contribute towards attainment of the goal for no overall net loss of the Nation's wetlands by providing opportunities to compensate for authorized impacts when mitigation might not otherwise be appropriate or practicable.

II. POLICY CONSIDERATIONS

The following policy considerations provide general guidance for the establishment, use and operation of mitigation banks. It is the agencies' intent that this guidance be applied to mitigation bank proposals submitted for approval on or after the effective date of this guidance and to those in early stages of planning or development. It is not intended that this policy be retroactive for mitigation banks that have already received agency approval. While it is recognized that individual mitigation banking proposals may vary, it is the intent of this guidance that the fundamental precepts be applicable to future mitigation banks.

For the purposes of Section 10/104, and consistent with the CEQ regulations, the Guidelines, and the Memorandum of Agreement Between the Environmental Protection Agency (EPA) and the Department of the Army Concerning the Determination of Mitigation under the Clean Water Act Section 404(b)(1) Guidelines, mitigation means sequentially avoiding impacts, minimizing impacts, and compensating for remaining unavoidable impacts. Compensatory mitigation, under Section 10/404, is the restoration, creation, enhancement, or in exceptional circumstances, preservation of wetlands and/or other aquatic resources for the purpose of compensating for unavoidable adverse impacts. A site where wetlands and/or other aquatic resources are restored, created, enhanced, or in exceptional circumstances, preserved expressly for the purpose of providing compensatory mitigation in advance of authorized impacts to similar resources is a mitigation bank.

A. Authorities

This guidance is established in accordance with the following statutes, regulations, and policies. It is intended to clarify provisions within these existing authorities and does to establish any new requirements.

1. Clean Water Act Section 404 (33 U.S.C. 1344).
2. Rivers and Harbors Act of 1899 Section 10 (33 U.S.C. 403 et seq.)
3. Environmental Protection Agency, Section 404(b)(1) Guidelines (40 CFR Part 230). Guidelines for Specification of Disposal Sites for Dredged or Fill Material:
4. Department of the Army, Section 404 Permit Regulations (33 CFR Parts 320-330). Policies for evaluating permit applications to discharge dredged or fill material.
5. Memorandum of Agreement between the Environmental Protection Agency and the Department of the Army Concerning the Determination of Mitigation under the Clean Water Act Section 404(b)(1) Guidelines (February 6, 1990).
6. Title XII Food Security Act of 1985 as amended by the Food, Agriculture, Conservation and Trade Act of 1990 (16 U.S.C. 3801 et seq.).
7. National Environmental Policy Act (42 U.S.C. 4321 et seq.), including the Council on Environmental Quality's implementing regulations (40 CFR Parts 1500-1508).
8. Fish and Wildlife Coordination Act (16 U.S.C. 661 et seq.).
9. Fish and Wildlife Service Mitigation Policy (46 FR pages 7644-7663, 1981).
10. Magnuson Fishery Conservation and Management Act (16 U.S.C. 1801 et seq.).
11. National Marine Fisheries Service Habitat Conservation Policy (48 FR pages 53142-53147, 1983).

The policies set out in this document are not final agency action, but are intended solely as guidance. The guidance is not intended, nor can it be relied upon, to create any rights **[[Page 58608]]** enforceable by any party in litigation with the United States. This guidance does not establish or affect legal rights or obligations, establish a binding norm on any party and it is not finally determinative of the issues addressed. Any regulatory decisions made by the agencies in any particular matter addressed by this guidance will be made by applying the governing law and regulations to the relevant facts.

B. Planning Considerations

1. Goal Setting.

The overall goal of a mitigation bank is to provide economically efficient and flexible mitigation opportunities, while fully compensating for wetland and other aquatic resource losses in a manner that contributes to the long-term ecological functioning of the watershed within which the bank is to be located. The goal will include the need to replace essential aquatic functions which are anticipated to be lost through authorized activities within the bank's service area. In some cases, banks may also be used to address other resource objectives that have been identified in a watershed management plan or other resource assessment. It is desirable to set the particular objectives for a mitigation bank (i.e., the type and character of wetlands and/or aquatic resources to be established) in advance of site selection. The goal and objectives should be driven by the anticipated mitigation need; the site selected should support achieving the goal and objectives.

2. Site Selection.

The agencies will give careful consideration to the ecological suitability of a site for achieving the goal and objectives of a bank, i.e., that it posses the physical, chemical and biological characteristics to support establishment of the desired aquatic resources and functions. Size and location of the site relative to other ecological features, hydrologic sources (including the availability of water rights), and compatibility with adjacent land uses and watershed management plans are important factors for consideration. It also is important that ecologically significant aquatic or upland resources (e.g., shallow sub-tidal habitat, mature forests), cultural sites, or habitat for Federally or State-listed threatened and endangered species are not compromised in the process of establishing a bank. Other significant factors for consideration include, but are not limited to, development trends (i.e., anticipated land use changes), habitat status and trends, local or regional goals for the restoration or protection of particular habitat types or functions (e.g., re-establishment of habitat corridors or habitat for species of concern), water quality and floodplain management goals, and the relative potential for chemical contamination of the wetlands and/or other aquatic resources.

Banks may be sited on public or private lands. Cooperative arrangements between public and private entities to use public lands for mitigation banks may be acceptable. In some circumstances, it may be appropriate to site banks on Federal, state, tribal or locally-owned resource management areas (e.g., wildlife management areas, national or state forests, public parks, recreation areas). The siting of banks on such lands may be acceptable if the internal policies of the public agency allow use of its land for such purposes, and the public agency grants approval. Mitigation credits generated by banks of this nature should be based solely on those values in the bank that are supplemental to the public program(s) already planned or in place, that is, baseline values represented by existing or already planned public programs, including preservation value, should not be counted toward bank credits.

Similarly, Federally-funded wetland conservation projects undertaken via separate authority and for other purposes, such as the Wetlands Reserve Program, Farmer's Home Administration fee title transfers or conservation easements, and Partners for Wildlife Program, cannot be used for the purpose of generating credits within a mitigation bank. However, mitigation credit may be given for activities undertaken in conjunction with, but supplemental to, such programs in order to maximize the overall ecological benefit of the conservation project.

3. Technical Feasibility.

Mitigation banks should be planned and designed to be self-sustaining over time to the extent possible. The techniques for establishing wetlands and/or other aquatic resources must be carefully selected, since this science is constantly evolving. The restoration of historic or substantially-degraded wetlands and/or other aquatic resources (e.g., prior-converted cropland, farmed wetlands) utilizing proven techniques increases the likelihood of success and typically does not result in the loss of other valuable resources. Thus, restoration should be the first option considered when siting a bank. Because of the difficulty in establishing the correct hydrologic conditions associated with many creation projects and the tradeoff in wetland functions involved with certain enhancement activities, these methods should only be considered where there are adequate assurances to ensure success and that the project will result in an overall environmental benefit.

In general, banks which involve complex hydraulic engineering features and/or questionable water sources (e.g., pumped) are most costly to develop, operate and maintain, and have a higher risk of failure than banks designed to function with little or no human intervention. The former situations should only be

considered where there are adequate assurances to ensure success. This guidance recognizes that in some circumstances wetlands must be actively managed to ensure their viability and sustainability. Furthermore, long-term maintenance requirements may be necessary and appropriate in some cases (e.g., to maintain fire-dependent plant communities in the absence of natural fire; to control invasive exotic plant species).

Proposed mitigation techniques should be well-understood and reliable. When uncertainties surrounding the technical feasibility of a proposed mitigation technique exist, appropriate arrangements (e.g., financial assurances, contingency plans, additional monitoring requirements) should be in place to increase the likelihood of success. Such arrangements may be phased-out or reduced once the attainment of prescribed performance standards is demonstrated.

4. Role of Preservation.

Credit may be given when existing wetlands and/or other aquatic resources are preserved in conjunction with restoration, creation or enhancement activities, and when it is demonstrated that the preservation will augment the functions of the restored, created or enhanced aquatic resource. Such augmentation may be reflected in the total number of credits available from the bank.

In addition, the preservation of existing wetlands and/or other aquatic resources in perpetuity may be authorized as the sole basis for generating credits in mitigation banks only in exceptional circumstances, consistent with existing regulations, policies and guidance. Under such circumstances, preservation may be accomplished through the implementation of appropriate legal mechanisms (e.g., transfer of deed, deed restrictions, conservation easement) to protect wetlands and/or other aquatic resources, accompanied by **[[Page 58609]]** implementation of appropriate changes in land use or other physical changes as necessary (e.g., installation of restrictive fencing).

Determining whether preservation is appropriate as the sole basis for generating credits at a mitigation bank requires careful judgment regarding a number of factors. Consideration must be given to whether wetlands and/or other aquatic resources proposed for preservation (1) perform physical or biological functions, the preservation of which is important to the region in which the aquatic resources are located, and (2) are under demonstrable threat of loss or substantial degradation due to human activities that might not otherwise be expected to be restricted. The existence of a demonstrable threat will be based on clear evidence of destructive land use changes which are consistent with local and regional land use trends and are not the consequence of actions under the control of the bank sponsor. Wetlands and other aquatic resources restored under the Conservation Reserve Program or similar programs requiring only temporary conservation easements may be eligible for banking credit upon termination of the original easement if the wetlands are provided permanent protection and it would otherwise be expected that the resources would be converted upon termination of the easement. The number of mitigation credits available from a bank that is based solely on preservation should be based on the functions that would otherwise be lost or degraded if the aquatic resources were not preserved, and the timing of such loss or degradation. As such, compensation for aquatic resource impacts will typically require a greater number of acres from a preservation bank than from a bank which is based on restoration, creation or enhancement.

5. Inclusion of Upland Areas.

Credit may be given for the inclusion of upland areas occurring within a bank only to the degree that such features increase the overall ecological functioning of the bank. If such features are included as part of a bank, it is important that they receive the same protected status as the rest of the bank and be subject

to the same operational procedures and requirements. The presence of upland areas may increase the per-unit value of the aquatic habitat in the bank. Alternatively, limited credit may be given to upland areas protected within the bank to reflect the functions inherently provided by such areas (e.g., nutrient and sediment filtration of stormwater runoff, wildlife habitat diversity) which directly enhance or maintain the integrity of the aquatic ecosystem and that might otherwise be subject to threat of loss or degradation. An appropriate functional assessment methodology should be used to determine the manner and extent to which such features augment the functions of restored, created or enhanced wetlands and/or other aquatic resources.

6. Mitigation Banking and Watershed Planning.

Mitigation banks should be planned and developed to address the specific resource needs of a particular watershed. Furthermore, decisions regarding the location, type of wetlands and/or other aquatic resources to be established, and proposed uses of a mitigation bank are most appropriately made within the context of a comprehensive watershed plan. Such watershed planning efforts often identify categories of activities having minimal adverse effects on the aquatic ecosystem and that, therefore, could be authorized under a general permit. In order to reduce the potential cumulative effects of such activities, it may be appropriate to offset these types of impacts through the use of a mitigation bank established in conjunction with a watershed plan.

C. Establishment of Mitigation Banks

1. Prospectus

Prospective bank sponsors should first submit a prospectus to the Army Corps of Engineers (Corps) or Natural Resources Conservation Service (NRCS)¹ to initiate the planning and review process by the appropriate agencies. Prior to submitting a prospectus, bank sponsors are encouraged to discuss their proposal with the appropriate agencies (e.g., pre-application coordination).

It is the intent of the agencies to provide practical comments to the bank sponsors regarding the general need for and technical feasibility of proposed banks. Therefore, bank sponsors are encouraged to include in the prospectus sufficient information concerning the objectives for the bank and how it will be established and operated to allow the agencies to provide such feedback. Formal agency involvement and review is initiated with submittal of a prospectus.

2. Mitigation Banking Instruments

Information provided in the prospectus will serve as the basis for establishing the mitigation banking instrument. All mitigation banks need to have a banking instrument as documentation of agency concurrence on the objectives and administration of the bank. The banking instrument should describe in detail the physical and legal characteristics of the bank, and how the bank will be established and operated. For regional banking programs sponsored by a single entity (e.g., a state transportation agency), it may be appropriate to establish an "umbrella" instrument for the establishment and operation of multiple

¹ The Corps will typically serve as the lead agency for the establishment of mitigation banks. Bank sponsors proposing establishment of mitigation banks solely for the purpose of complying with the "Swampbuster" provisions of FSA should submit their prospectus to the NRCS.

bank sites. In such circumstances, the need for supplemental site-specific information (e.g., individual site plans) should be addressed in the banking instrument. The banking instrument will be signed by the bank sponsor and the concurring regulatory and resource agencies represented on the Mitigation Bank Review Team (section II.C.2). The following information should be addressed, as appropriate, within the banking instrument:

- a. Bank goals and objectives;
- b. Ownership of bank lands;
- c. Bank size and classes of wetlands and/or other aquatic resources proposed for inclusion in the bank, including a site plan and specifications;
- d. Description of baseline conditions at the bank site;
- e. Geographic service area;
- f. Wetland classes or other aquatic resource impacts suitable for compensation;
- g. Methods for determining credits and debits;
- h. accounting procedures;
- i. Performance standards for determining credit availability and bank success;
- j. Reporting protocols and monitoring plan;
- k. Contingency and remedial actions and responsibilities;
- l. Financial assurances;
- m. Compensation ratios;
- n. Provisions for long-term management and maintenance.

The terms and conditions of the banking instrument may be amended, in accordance with the procedures used to establish the instrument and subject to agreement by the signatories.

In cases where initial establishment of the mitigation bank involves a discharge into waters of the United States requiring Section 10/404 authorization, the banking instrument will be made part of a Department of the Army permit for that discharge. Submittal of an **[[Page 58610]]** individual permit application should be accompanied by a sufficiently-detailed prospectus to allow for concurrent processing of each. Preparation of a banking instrument, however, should not alter the normal permit evaluation process timeframes. A bank sponsor may proceed with activities for the construction of a bank subsequent to receiving the Department of the Army authorization. It should be noted, however, that a bank sponsor who proceeds in the absence of a banking instrument does so at his/her own risk.

In cases where the mitigation bank is established pursuant to the FSA, the banking instrument will be included in the plan developed or approved by NRCS and the Fish and Wildlife Service (FWS).

3. Agency Roles and Coordination

Collectively, the signatory agencies to the banking instrument will comprise the Mitigation Bank Review Team (MBRT). Representatives from the Corps, EPA, FWS, National Marine Fisheries Service (NMFS) and NRCS, as appropriate given the projected use for the bank, should typically comprise the MBRT. In addition, it is appropriate for representatives from state, tribal and local regulatory and resource agencies to participate where an agency has authorities and/or mandates directly affecting or affected by the establishment, use or operation of a bank. No agency is required to sign a banking instrument; however, in signing a banking instrument, an agency agrees to the terms of that instrument.

The Corps will serve as Chair of the MBRT, except in cases where the bank is proposed solely for the purpose of complying with the FSA, in which case NRCS will be the MBRT Chair. In addition, where a bank is proposed to satisfy the requirements of another Federal, state, tribal or local program, it may be appropriate for the administering agency to serve as co-Chair of the MBRT.

The primary role of the MBRT is to facilitate the establishment of mitigation banks through the development of mitigation banking instruments. Because of the different authorities and responsibilities of each agency represented on the MBRT, there is a benefit in achieving agreement on the banking instrument. For this reason, the MBRT will strive to obtain consensus on its actions. The Chair of the MBRT will have the responsibility for making final decisions regarding the terms and conditions of the banking instrument where consensus cannot otherwise be reached within a reasonable timeframe (e.g., 90 days from the date of submittal of a complete prospectus). The MBRT will review and seek consensus on the banking instrument and final plans for the restoration, creation, enhancement, and/or preservation of wetlands and other aquatic resources.

Consistent with its authorities under Section 10/404, the Corps is responsible for authorizing use of a particular mitigation bank on a project-specific basis and determining the number and availability of credits required to compensate for proposed impacts in accordance with the terms of the banking instrument. Decisions rendered by the Corps must fully consider review agency comments submitted as part of the permit evaluation process. Similarly, the NRCS, in consultation with the FWS, will make the final decision pertaining to the withdrawal of credits from banks as appropriate mitigation pursuant to FSA.

4. Role of the Bank Sponsor

The bank sponsor is responsible for the preparation of the banking instrument in consultation with the MBRT. The bank sponsor should, therefore, have sufficient opportunity to discuss the content of the banking instrument with the MBRT. The bank sponsor is also responsible for the overall operation and management of the bank in accordance with the terms of the banking instrument, including the preparation and distribution of monitoring reports and accounting statements/ledger, as necessary.

5. Public Review and Comment

The public should be notified of and have an opportunity to comment on all bank proposals. For banks which require authorization under an individual Section 10/404 permit or a state, tribal or local program that involves a similar public notice and comment process, this condition will typically be satisfied through such standard procedures. For other proposals, the Corps or NRCS, upon receipt of a complete banking prospectus, should provide notification of the availability of the prospectus for a minimum 21-day public comment period. Notification procedures will be similar to those used by the Corps in the standard permit review process. Copies of all public comments received will be distributed to the other members of the MBRT and the bank sponsor for full consideration in the development of the final banking instrument.

6. Dispute Resolution Procedure

The MBRT will work to reach consensus on its actions in accordance with this guidance. It is anticipated that all issues will be resolved by the MBRT in this manner.

a. Development of the Banking Instrument

During the development of the banking instrument, if any agency representative considers that a particular decision raises concern regarding the application of existing policy or procedures, an agency

may request, through written notification, that the issue be reviewed by the Corps District Engineer, or NRCS State Conservationist, as appropriate. Said notification will describe the issue in sufficient detail and provide recommendations for resolution. Within 20 days, the District Engineer or State Conservationist (as appropriate) will consult with the notifying agency(ies) and will resolve the issue. The resolution will be forwarded to the other MBRT member agencies. The bank sponsor may also request the District Engineer or State Conservationist review actions taken to develop the banking instrument if the sponsor believes that inadequate progress has been made on the instrument by the MBRT.

b. Application of the Banking Instrument

As previously stated, the Corps and NRCS are responsible for making final decisions on a project-specific basis regarding the use of a mitigation bank for purposes of Section 10/404 and FSA, respectively. In the event an agency on the MBRT is concerned that a proposed use may be inconsistent with the terms of the banking instrument, that agency may raise the issue to the attention of the Corps or NRCS through the permit evaluation process. In order to facilitate timely and effective consideration of agency comments, the Corps or NRCS, as appropriate, will advise the MBRT agencies of a proposed use of a bank. The Corps will fully consider comments provided by the review agencies regarding mitigation as part of the permit evaluation process. The NRCS will consult with FWA is making its decisions pertaining to mitigation.

If, in the view of an agency on the MBRT, an issued permit or series of permits reflects a pattern of concern regarding the application of the terms of the banking instrument, that agency may initiate review of the concern by the full MBRT through written notification to the MBRT Chair. The MBRT Chair will convene a meeting of the MBRT, or initiate another appropriate forum for communication, typically within 20 days of receipt of notification, to resolve concerns. Any such effort to address concerns **[[Page 58611]]** regarding the application of a banking instrument will not delay any decision pending before the authorizing agency (e.g., Corps or NRCS).

D. Criteria for Use of a Mitigation Bank

1. Project Applicability

All activities regulated under Section 10/404 may be eligible to use a mitigation bank as compensation for unavoidable impacts to wetlands and/or other aquatic resources. Mitigation banks established for FSA purposes may be debited only in accordance with the mitigation and replacement provisions of 7 CFR Part 12.

Credits from mitigation banks may also be used to compensate for environmental impacts authorized under other programs (e.g., state or local wetland regulatory programs, NPDES program, Corps civil works projects, Superfund removal and remedial actions). In no case may the same credits be used to compensate for more than one activity; however, the same credits may be used to compensate for an activity which requires authorization under more than one program.

2. Relationship to Mitigation Requirements

Under the existing requirements of Section 10/404, all appropriate and practicable steps must be undertaken by the applicant to first avoid and then minimize adverse impacts to aquatic resources, prior to authorization to use a particular mitigation bank. Remaining unavoidable impacts must be compensated to

the extent appropriate and practicable. For both the Section 10/404 and "Swampbuster" programs, requirements for compensatory mitigation may be satisfied through the use of mitigation banks when either on-site compensation is not practicable or use of the mitigation bank is environmentally preferable to on-site compensation.

It is important to emphasize that applicants should not expect that establishment of, or purchasing credits from, a mitigation bank will necessarily lead to a determination of compliance with applicable mitigation requirements (i.e., Section 404(b)(1) Guidelines or FSA Manual), or as excepting projects from any applicable requirements.

3. Geographic Limits of Applicability

The service area of a mitigation bank is the area (e.g., watershed, county) wherein a bank can reasonably be expected to provide appropriate compensation for impacts to wetlands and/or other aquatic resources. This area should be designated in the banking instrument. Designation of the service area should be based on consideration of hydrologic and biotic criteria, and be stipulated in the banking instrument. Use of a mitigation bank to compensate for impacts beyond the designated service area may be authorized, on a case-by-case basis, where it is determined to be practicable and environmentally desirable.

The geographic extent of a service area should, to the extent environmentally desirable, be guided by the cataloging unit of the "Hydrologic Unit map of the United States" (USGS, 1980) and the ecoregion of the "Ecoregions of the United States" (James M. Omernik, EPA, 1986) or section of the "Descriptions of the Ecoregions of the United States" (Robert G. Bailey, USDA, 1980). It may be appropriate to use other classification systems developed at the state or regional level for the purpose of specifying bank service areas, when such systems compare favorably in their objectives and level of detail. In the interest of the integrating banks with other resource management objectives, bank service areas may encompass larger watershed areas if the designation of such areas is supported by local or regional management plans (e.g., Special Area Management Plans, Advance Identification), State Wetland Conservation Plans or other Federally sponsored or recognized resource management plans. Furthermore, designation of a more inclusive service area may be appropriate for mitigation banks whose primary purpose is to compensate for linear projects that typically involve numerous small impacts in several different watersheds.

4. Use of a Mitigation Bank vs. On-Site Mitigation

The agencies' preference for on-site mitigation, indicated in the 1990 Memorandum of Agreement on mitigation between the EPA and the Department of the Army, should not preclude the use of a mitigation bank when there is no practicable opportunity for on-site compensation, or when use of a bank is environmentally preferable to on-site compensation. On-site mitigation may be preferable where there is a practicable opportunity to compensate for important local functions including local flood control functions, habitat for a species or population with a very limited geographic range or narrow environmental requirements, or where local water quality concerns dominate.

In choosing between on-site mitigation and use of a mitigation bank, careful consideration should be given to the likelihood for successfully establishing the desired habitat type, the compatibility of the mitigation project with adjacent land uses, and the practicability of long-term monitoring and maintenance to determine whether the effort will be ecologically sustainable, as well as the relative cost of mitigation alternatives. In general, use of a mitigation bank to compensate for minor aquatic resource impacts (e.g.,

numerous, small impacts associated with linear projects; impacts authorized under nationwide permits) is preferable to on-site mitigation. With respect to larger aquatic resource impacts, use of a bank may be appropriate if it is capable of replacing essential physical and/or biological functions of the aquatic resources which are expected to be lost or degraded. Finally, there may be circumstances warranting a combination of on-site and off-site mitigation to compensate for losses.

5. In-kind vs. Out-of-kind Mitigation Determinations

In the interest of achieving functional replacement, in-kind compensation of aquatic resource impacts should generally be required. Out-of-kind compensation may be acceptable if it is determined to be practicable and environmentally preferable to in-kind compensation (e.g., of greater ecological value to a particular region). However, non-tidal wetlands should typically not be used to compensate for the loss or degradation of tidal wetlands. Decisions regarding out-of-kind mitigation are typically made on a case-by-case basis during the permit evaluation process. The banking instrument may identify circumstances in which it is environmentally desirable to allow out-of-kind compensation within the context of a particular mitigation bank (e.g., for banks restoring a complex of associated wetland types). Mitigation banks developed as part of an area-wide management plan to address a specific resource objective (e.g., restoration of a particularly vulnerable or valuable wetland habitat type) may be such an example.

6. Timing of Credit Withdrawal

The number of credits available for withdrawal (i.e., debiting) should generally be commensurate with the level of aquatic functions attained at a bank at the time of debiting. The level of function may be determined through the application of performance standards tailored to the specific restoration, creation or enhancement activity at the bank site or through the use of an appropriate functional assessment methodology. **[[Page 58612]]**

The success of a mitigation bank with regard to its capacity to establish a healthy and fully functional aquatic system relates directly to both the ecological and financial stability of the bank. Since financial considerations are particularly critical in early stages of bank development, it is generally appropriate, in cases where there is adequate financial assurance and where the likelihood of the success of the bank is high, to allow limited debiting of a percentage of the total credits projected for the bank at maturity. Such determinations should take into consideration the initial capital costs needed to establish the bank, and the likelihood of its success. However, it is the intent of this policy to ensure that those actions necessary for the long-term viability of a mitigation bank be accomplished prior to any debiting of the bank. In this regard, the following minimum requirements should be satisfied prior to debiting: (1) banking instrument and mitigation plans have been approved; (2) bank site has been secured; and (3) appropriate financial assurances have been established. In addition, initial physical and biological improvements should be completed no later than the first full growing season following initial debiting of a bank. The temporal loss of functions associated with the debiting of projected credits may justify the need for requiring higher compensation ratios in such cases. For mitigation banks which propose multiple-phased construction, similar conditions should be established for each phase.

Credits attributed to the preservation of existing aquatic resources may become available for debiting immediately upon implementation of appropriate legal protection accompanied by appropriate changes in land use or other physical changes, as necessary.

7. Crediting/Debiting/Accounting Procedures

Credits and debits are the terms used to designate the units of trade (i.e., currency) in mitigation banking. Credits represent the accrual or attainment of aquatic functions at a bank; debits represent the loss of aquatic functions at an impact or project site. Credits are debited from a bank when they are used to offset aquatic resource impacts (e.g., for the purpose of satisfying Section 10/404 permit or FSA requirements).

An appropriate functional assessment methodology (e.g., Habitat Evaluation Procedures, hydrogeomorphic approach to wetlands functional assessment, other regional assessment methodology) acceptable to all signatories should be used to assess wetland and/or other aquatic resource restoration, creation and enhancement activities within a mitigation bank, and to quantify the amount of available credits. The range of functions to be assessed will depend upon the assessment methodology identified in the banking instrument. The same methodology should be used to assess both credits and debits. If an appropriate functional assessment methodology is impractical to employ, acreage may be used as a surrogate for measuring function. Regardless of the method employed, the number of credits should reflect the difference between site conditions under the with-and without-bank scenarios.

The bank sponsor should be responsible for assessing the development of the bank and submitting appropriate documentation of such assessments to the authorizing agency(ies), who will distribute the documents to the other members of the MBRT for review. Members of the MBRT are encouraged to conduct regular (e.g., annual) on-site inspections, as appropriate, to monitor bank performance. Alternatively, functional assessments may be conducted by a team representing involved resources and regularly agencies and other appropriate parties. The number of available credits in a mitigation bank may need to be adjusted to reflect actual conditions.

The banking instrument should require that bank sponsors establish and maintain an accounting system (i.e., ledger) which documents the activity of all mitigation bank accounts. Each time an approved debit/credit transaction occurs at a given bank, the bank sponsor should submit a statement to the authorizing agency(ies). The bank sponsor should also generate an annual ledger report for all mitigation bank accounts to be submitted to the MBRT Chair for distribution to each member of the MBRT.

Credits may be sold to third parties. The cost of mitigation credits to a third party is determined by the bank sponsor.

8. Party Responsible for Bank Success

The bank sponsor is responsible for assuring the success of the debited restoration, creation, enhancement and preservation activities at the mitigation bank, and it is therefore extremely important that an enforceable mechanism be adopted establishing the responsibility of the bank sponsor to develop and operate the bank properly. Where authorization under Section 10/404 and/or FSA is necessary to establish the bank, the Department of the Army permit or NRCS plan should be conditioned to ensure that provisions of the banking instrument are enforceable by the appropriate agency(ies). In circumstances where establishment of a bank does not require such authorization, the details of the bank sponsor's responsibilities should be delineated by the relevant authorizing agency (e.g., the Corps in the case of Section 10/404 permits) in any permit in which the permittee's mitigation obligations are met through use of the bank. In addition, the bank sponsor should sign such permits for the limited purpose of meeting those mitigation responsibilities, thus confirming that those responsibilities are enforceable against the bank sponsor if necessary.

E. Long-Term Management, Monitoring and Remediation

1. Bank Operational Life

The operational life of a bank refers to the period during which the terms and conditions of the banking instrument are in effect. With the exception of arrangements for the long-term management and protection in perpetuity of the wetlands and/or other aquatic resources, the operational life of a mitigation bank terminates at the point when (1) Compensatory mitigation credits have been exhausted or banking activity is voluntarily terminated with written notice by the bank sponsor provided to the Corps or NRCS and other members of the MBRT, and (2) it has been determined that the debited bank is functionally mature and/or self-sustaining to the degree specified in the banking instrument.

2. Long-term Management and Protection

The wetlands and/or other aquatic resources in a mitigation bank should be protected in perpetuity with appropriate real estate arrangements (e.g., conservation easements, transfer of title to Federal or State resource agency or non-profit conservation organization). Such arrangements should effectively restrict harmful activities (i.e., incompatible uses²) that might otherwise jeopardize the purpose of the bank. In exceptional circumstances, real estate arrangements may be approved which dictate finite protection for a bank (e.g., for coastal protection projects which prolong the ecological viability of [\[Page 58613\]](#) the aquatic system). However, in no case should finite protection extend for a lesser time than the duration of project impacts for which the bank is being used to provide compensation.

The bank sponsor is responsible for securing adequate funds for the operation and maintenance of the bank during its operational life, as well as for the long-term management of the wetlands and/or other aquatic resources, as necessary. The banking instrument should identify the entity responsible for the ownership and long-term management of the wetlands and/or other aquatic resources. Where needed, the acquisition and protection of water rights should be secured by the bank sponsor and documented in the banking instrument.

3. Monitoring Requirements

The bank sponsor is responsible for monitoring the mitigation bank in accordance with monitoring provisions identified in the banking instrument to determine the level of success and identify problems requiring remedial action. Monitoring provisions should be set forth in the banking instrument and based on scientifically sound performance standards prescribed for the bank. Monitoring should be conducted at time intervals appropriate for the particular project type and until such time that the authorizing agency(ies), in consultation with the MBRT, are confident that success is being achieved (i.e., performance standards are attained). The period for monitoring will typically be five years; however, it may be necessary to extend this period for projects requiring more time to reach a stable condition (e.g., forested wetlands) or where remedial activities were undertaken. Annual monitoring reports should be submitted to the authorizing agency(ies), who is responsible for distribution to the other members of the MBRT, in accordance with the terms specified in the banking instrument.

² For example, certain silvicultural practices (e.g., clear cutting and/or harvests on short-term rotations) may be incompatible with the objectives of a mitigation bank. In contrast, silvicultural practices such as long-term rotations, selective cutting, maintenance of vegetation diversity, and undisturbed buffers are more likely to be considered a compatible use.

4. Remedial Action

The banking instrument should stipulate the general procedures for identifying and implementing remedial measures at a bank, or any portion thereof. Remedial measures should be based on information contained in the monitoring reports (i.e., the attainment of prescribed performance standards), as well as agency site inspections. The need for remediation will be determined by the authorizing agency(ies) in consultation with the MBRT and bank sponsor.

5. Financial Assurances

The bank sponsor is responsible for securing sufficient funds or other financial assurances to cover contingency actions in the event of bank default or failure. Accordingly, banks posing a greater risk of failure and where credits have been debited, should have comparatively higher financial sureties in place, than those where the likelihood of success is more certain. In addition, the bank sponsor is responsible for securing adequate funding to monitor and maintain the bank throughout its operational life, as well as beyond the operational life if not self-sustaining. Total funding requirements should reflect realistic cost estimates for monitoring, long-term maintenance, contingency and remedial actions.

Financial assurances may be in the form of performance bonds, irrevocable trusts, escrow accounts, casualty insurance, letters of credit, legislatively-enacted dedicated funds for government operate banks or other approved instruments. Such assurances may be phased-out or reduced, once it has been demonstrated that the bank is functionally mature and/or self-sustaining (in accordance with performance standards).

F. Other Considerations

1. In-lieu-fee Mitigation Arrangements.

For purposes of this guidance, in-lieu-fee, fee mitigation, or other similar arrangements, wherein funds are paid to a natural resource management entity for implementation of either specific or general wetland or other aquatic resource development projects, are not considered to meet the definition of mitigation banking because they do not typically provide compensatory mitigation in advance of project impacts. Moreover, such arrangements do not typically provide a clear timetable for the initiation of mitigation efforts. The Corps, in consultation with the other agencies, may find there are circumstances where such arrangements are appropriate so long as they meet the requirements that would otherwise apply to an offsite, prospective mitigation effort and provides adequate assurances of success and timely implementation. In such cases, a formal agreement between the sponsor and the agencies, similar to a banking instrument, is necessary to define the conditions under which its use is considered appropriate.

2. Special Considerations for "Swampbuster"

Current FSA legislation limits the extent to which mitigation banking can be used for FSA purposes. Therefore, if a mitigation bank is to be used for FSA purposes, it must meet the requirements of FSA.

III. DEFINITIONS

For the purposes of this guidance document the following terms are defined:

A. *Authorizing agency*. Any Federal, state, tribal or local agency that has authorized a particular use of a mitigation bank as compensation for an authorized activity; the authorizing agency will typically have the enforcement authority to ensure that the terms and conditions of the banking instrument are satisfied.

B. *Bank sponsor*. Any public or private entity responsible for establishing and, in most circumstances, operating a mitigation bank.

C. *Compensatory mitigation*. For purposes of Section 10/404, compensatory mitigation is the restoration, creation, enhancement, or in exceptional circumstances, preservation of wetlands and/or other aquatic resources for the purpose of compensating for unavoidable adverse impacts which remain after all appropriate and practicable avoidance and minimization has been achieved.

D. *Consensus*. The term consensus, as defined herein, is a process by which a group synthesizes its concerns and ideas to form a common collaborative agreement acceptable to all members. While the primary goal of consensus is to reach agreement on an issue by all parties, unanimity may not always be possible.

E. *Creation*. The establishment of a wetland or other aquatic resource where one did not formerly exist.

F. *Credit*. A unit of measure representing the accrual or attainment of aquatic functions at a mitigation bank; the measure of function is typically indexed to the number of wetland acres restored, created, enhanced or preserved.

G. *Debit*. A unit of measure representing the loss of aquatic functions at an impact or project site.

H. *Enhancement*. Activities conducted in existing wetlands or other aquatic resources which increase one or more aquatic functions.

I. *Mitigation*. For purposes of Section 10/404 and consistent with the Council on Environmental Quality regulations, the Section 404(b)(1) Guidelines and the Memorandum of Agreement Between [[Page 58614]] the Environmental Protection Agency and the Department of the Army Concerning the Determination of Mitigation under the Clean Water Act Section 404(b)(1) Guidelines, mitigation means sequentially avoiding impacts, minimizing impacts, and compensating for remaining unavoidable impacts.

J. *Mitigation bank*. A mitigation bank is a site where wetlands and/or other aquatic resources are restored, created, enhanced, or in exceptional circumstances, preserved expressly for the purpose of providing compensatory mitigation in advance of authorized impacts to similar resources. For purposes of Section 10/404, use of a mitigation bank may only be authorized when impacts are unavoidable.

K. *Mitigation Bank Review Team (MBRT)*. An interagency group of Federal, state, tribal and/or local regulatory and resource agency representatives which are signatory to a banking instrument and oversee the establishment, use and operation of a mitigation bank.

L. *Practicable*. Available and capable of being done after taking into consideration cost, existing technology, and logistics in light of overall project purposes.

M. *Preservation*. The protection of ecologically important wetlands or other aquatic resources in perpetuity through the implementation of appropriate legal and physical mechanisms. Preservation may include protection of upland areas adjacent to wetlands as necessary to ensure protection and/or enhancement of the aquatic ecosystem.

N. *Restoration*. Re-establishment of wetland and/or other aquatic resource characteristics and function(s) at a site where they have ceased to exist, or exist in a substantially degraded state.

O. *Service area*. The service area of a mitigation bank is the designated area (e.g., watershed, county) wherein a bank can reasonably be expected to provide appropriate compensation for impacts to wetlands

SUBJECT: Federal Guidance for the Establishment, Use and Operation of Mitigation Banks [Federal Register: 28 Nov 95 (Vol. 60, No. 228, pp. 58605-58614)]

and/or other aquatic resources.

John H. Zirschky, *Acting Assistant Secretary (Civil Works), Department of the Army.*

Robert Perciasepe, *Assistant Administrator for Water, Environmental Protection Agency.*

Thomas R. Hebert, *Acting Undersecretary for Natural Resources and Environment, Department of Agriculture.*

Robert P. Davison, *Acting Assistant Secretary for Fish and Wildlife and Parks, Department of the Interior.*

Douglas K. Hall, *Assistant Secretary for Oceans and Atmosphere, Department of Commerce.*

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BILLING CODE 3710-92-M

STATE DEP Guidelines for ENCUMBRANCE of PROPERTY

Mitigation Bank Rule, Section 62-342.650, F.A.C.

Preservation mechanisms for mitigation banks. Mitigation banks are important areas because they will be used to offset impacts to numerous projects. They are also required to be managed in perpetuity. Therefore, all mitigation banks must be placed into a permanent form of preservation.

Before Mitigation Credits may be used from any Mitigation Bank, or any phase of a Mitigation Bank, the banker must either (62-342.650(1)):

1. cause a fee interest to be conveyed to the Board of Trustees of the Internal Improvement Trust Fund ("Board of Trustees"), or
2. cause a conservation easement to be conveyed to both the Department and the District. This is discussed below.

Real Property Conveyances (62-342.650(1)(a)):

The rule allows for the conveyance of the fee simple interest in the land from the landowner to the Board of Trustees, so that the Trustees become the landowner.

1. All real property conveyances shall be (62-342.650(3)):
 - a. in fee simple,
 - b. by statutory warranty deed (aka statutory general warranty deed), special warranty deed, or other deed, and
 - c. without encumbrances that adversely affect the integrity of the bank and that are acceptable to the Board of Trustees.

The Board of Trustees will accept a quit claim deed to aid in clearing minor title defects or otherwise resolve a boundary question in the Mitigation Bank. Realize that the Board will act on each case individually and that this rule cannot *require* the Board to accept a quitclaim deed.

2. If a fee simple interest is being conveyed, the following audits (assessments) must be performed:
 - a. a Phase I environmental audit (assessment) (Attachment 10) identifying any environmental problems which may affect the liability of the Department or Board of Trustees, and
 - b. any additional audits (assessments) that the Phase I audit reveals as necessary to ensure that the Department or the Board of Trustees will not be liable for those environmental problems.

Review of real property conveyances.

The Department (for the Board of Trustees of the Internal Improvement Trust Fund- BTITF) only accepts conveyances that it will have the capability of managing. Generally, this means that if the parcel would expand an existing parcel of managed state land, further the acquisition efforts in an identified acquisition program, expand the boundaries of lands owned by other agencies, it may be an acceptable site.

When an applicant indicates that they want to donate land to the BTITF you must contact the BLA. *For your information*, copy of the initial form sent from the BLA to the donor is attached as Attachment 11. This will familiarize you with the issues that BLA is concerned with. **BLA needs to provide information to prospective donors and process the actual donation of land.** The SLERP project manager should be copied on all correspondence between the applicant and the BLA.

Contact persons in the Bureau of Land Acquisition.

For proposed land donations: Ed Cederholm, 488-2351
For environmental audits on land donations: Kathleen Greenwood, 488-2351

Conservation Easements (62-342.650(1)(b)):

1. The conservation easement must be deeded to both the DEP and the appropriate WMD (62-342.650(1)(b)), however, there may be instances where a higher degree of protection is desirable. If the banker agrees, another (or multiple) grantee can be added to the easement deed. (62-342.650(1))

Example. The Walker Ranch property was placed into an easement by Walt Disney World with the following grantees: FDEP, FGFWFC, SFWMD, The Nature Conservancy, and the ACOE (for enforcement purposes only).

Other environmental agencies of land trusts are potentially appropriate as additional grantees. Before approving their placement on the deed, it is wise to ensure that their objectives regarding the easement are compatible with the Department's.

2. Mitigation Banks on Federally owned land shall be encumbered in perpetuity by conservation easements or other mechanisms ensuring preservation in accordance with the Mitigation Bank permit. (62-342.650(1))

Example. The distinction has to do with the actual and intended land use of the site. The ownership of land by the National Park Service provides a higher degree of assurance that the mitigation bank will remain in the intended preserved condition than if the land were owned by the U.S. Forest Service, because one of their primary missions is to provide timber cutting. Unless the land owned by the Forest Service is in a wilderness designation it should be placed into an easement.

3. All conservation easements must:
- a. be granted in perpetuity. (62-342.650(2))
 - b. be granted without encumbrances, unless the encumbrances do not adversely affect the ecological viability of the Mitigation Bank. (62-342.650(2))
 - c. be of a form and content sufficient to ensure preservation of the Mitigation Bank according to the permit. (62-342.650(2))
 - d. at a minimum, be consistent with all the requirements and restrictions of Section 704.06, F.S. (Attachment 7), except as provided in subsection 62-342.650(9). (62-342.650(2))
 - e. provide the banker and the Department access to the property to perform all acts necessary to ensure compliance with the Mitigation Bank Permit and other permits issued under pursuant to Chapters 373 and 403, F.S. (62-342.650(9))

All Conveyances:

1. The grantor needs to provide a series of things unless the Department decides that these items are not necessary to ensure preservation of the Mitigation Bank (62-342.650(4)):

(a) A boundary survey of the property or the area within the conservation easement.

The survey must be certified (62-342.650(4)):

1. by a land surveyor registered in the State of Florida,
2. to meet the requirements of the Department, and
3. to meet the minimum technical standards set forth by the Florida Board of Professional Land Surveyors in Chapter 21 HH-6, Florida Administrative Code, pursuant to Section 472.027, F.S. **Note: Chapter 21 HH-6 has been renumbered to Chapter 61G17, F.A.C. and is included as Attachment 6.**

(b) A certified appraisal of the market value of the property or interest to be conveyed to determine the appropriate amount of title insurance (62-342.650(4)). The bureau of land acquisition does not require appraisals for donations of land, although title insurance is required. BLA will be processing the donation, so this point is for your information.

(c) Assurance of the marketability of the interest in real property being acquired (62-342.650(4)):

1. in the form of a marketable title commitment and owner's title policy (ALTA Form B)

2. in an amount at least equal to the fair market value, as established in subsection 62-342.650(4)(b), of the real property.

The coverage, form and exceptions of the title insurance policy shall ensure that the Mitigation Bank will be preserved according to the Mitigation Bank permit.

2. The Department can require additional documentation or actions from the grantor of the conservation easement or fee interest if it would be necessary to ensure that the Mitigation Bank will be preserved according to the Mitigation Bank permit. (62-342.650(5))

Example: If a cattle dip site is found on the property, the toxicity of the site would need to be evaluated. It may be decided that the site needs to be cleaned up, excised from the property that will be conveyed, or treated in some other manner.

3. The grantor shall pay:
 1. the documentary revenue stamp tax (62-342.650(6)),
 2. other costs associated with the conveyance (62-342.650(6)), and
 3. all real estate taxes and assessments. (62-342.650(7))
4. The grantor has to remove all abandoned personal property and solid waste from the property. (62-342.650(8))
5. The banker has to record the easement or deed and submit a certified copy to the Department. The permit will specify the time frame for these actions. (62-342.650(10))

Appendix C -Property Conveyance/Conservation Easements

ENROLLED

1996 Legislature

CS/HB 2241, Second Engrossed

1 activity regulated under this part cannot be reconciled with
2 mitigation requirements approved under a permit for the same
3 activity issued under this part, the mitigation requirements
4 for surface water and wetland impacts shall be controlled by
5 the permit issued under this part.

6 Section 6. Section 373.4135, Florida Statutes, is
7 amended to read:

8 373.4135. Mitigation banks and offsite regional
9 mitigation banking.--

10 (1) The Legislature finds that the adverse impacts of
11 activities regulated under this part may be offset by the
12 creation, and maintenance, and use of regional-mitigation
13 areas or mitigation banks and offsite regional mitigation.
14 Mitigation banks and offsite regional mitigation can enhance
15 the certainty of minimize mitigation uncertainty and provide
16 ecological value due to the improved likelihood of
17 environmental success associated with their proper
18 construction, maintenance, and management benefits.
19 Therefore, the department and the water management districts
20 are directed to participate in and encourage the establishment
21 of private and public regional-mitigation-areas and mitigation
22 banks and offsite regional mitigation. Mitigation banks and
23 offsite regional mitigation should emphasize the restoration
24 and enhancement of degraded ecosystems and the preservation of
25 uplands and wetlands as intact ecosystems rather than
26 alteration of landscapes to create wetlands. This is best
27 accomplished through restoration of ecological communities
28 that were historically present.

29 (a) The Legislature intends that the provisions for
30 establishing mitigation banks apply equally to both public and
31 private entities, except that the rules of the department and

ENROLLED

1996 Legislature

CS/HB 2241, Second Engrossed

1 water management districts may set forth different measures
2 governing financial responsibility, and different measures
3 governing legal interest, needed to ensure the construction
4 and perpetual protection of a mitigation bank.

5 (b) It is the further intent of the Legislature that
6 mitigation banks and offsite regional mitigation be considered
7 appropriate and a permissible mitigation option under the
8 conditions specified by the rules of the department and water
9 management districts.

10 (c) Offsite mitigation, including offsite regional
11 mitigation, may be located outside the regional watershed in
12 which the adverse impacts of an activity regulated under this
13 part are located, if such adverse impacts are offset by the
14 offsite mitigation.

15 (d) The department or water management district may
16 allow the use of a mitigation bank or offsite regional
17 mitigation alone or in combination with other forms of
18 mitigation to offset adverse impacts of activities regulated
19 under this part.

20 (e) When an applicant for a permit under the
21 provisions of this part other than s. 373.4135 and 373.4136
22 submits more than one mitigation proposal to the department or
23 a water management district, the department or water
24 management district shall, in evaluating each proposal, ensure
25 that such proposal adequately offsets the adverse impacts.

26 (2) Local governments shall not deny the use of a
27 mitigation bank or offsite regional mitigation due to its
28 location outside of the jurisdiction of the local government.

29 (3) Nothing in s. 373.4135 or s. 373.4136 shall be
30 construed to eliminate or diminish any of the regulatory
31

1 ~~requirements applicable to applicants seeking permits pursuant~~
2 ~~to other provisions of this part.~~

3 (4) Except as otherwise provided herein, nothing in s.
4 373.4135 or s. 373.4136 shall be construed to diminish or
5 limit the existing authority of the department, water
6 management districts, or local governments.

7 (5) Nothing in s. 373.4135 or s. 373.4136 shall be
8 construed to limit the consideration of forms of mitigation
9 other than mitigation banks and offsite regional mitigation.
10 The department and the districts are directed to adopt rules
11 by January 1, 1994, governing the use of mitigation banks.
12 Such rules shall include:

13 (1)--Circumstances in which mitigation banking is
14 appropriate or desirable;

15 (2)--Provisions for the establishment of mitigation
16 banks by governmental, nonprofit, or for-profit private
17 entities with sufficient legal or equitable interest in the
18 property proposed for mitigation banking;

19 (3)--Procedures for the review of mitigation banking
20 proposals in a timely manner pursuant to chapter 129;

21 (4)--A framework for determining the value of a
22 mitigation bank, considering the ecological value of the
23 mitigation bank compared to the area where adverse impacts to
24 wetlands or surface waters are proposed; Mitigation banks
25 found to be successful prior to withdrawal of credit shall
26 receive greater credit than mitigation which has not yet
27 achieved success;

28 (5)--Procedures for the administration of bank credits
29 so that accounting responsibilities are not unnecessarily
30 duplicated between a water management district and the
31 department;

1 (6)--Requirements to ensure the financial
2 responsibility of nongovernmental entities proposing to
3 develop mitigation banks;

4 (7)--Measures required to ensure the long-term
5 management and protection of mitigation banks;

6 (8)--Criteria for the withdrawal of mitigation credits
7 by projects within or outside the regional watershed where the
8 bank is located;

9 (9)--Criteria governing the contribution of funds or
10 land to an approved mitigation bank;

11 (10)--Criteria allowing the withdrawal of credits by
12 parties other than the party creating the bank; and

13 (11)--Provisions for the consideration of creation,
14 restoration, enhancement, and preservation of wetlands and
15 uplands as part of a mitigation bank;

16 Section 7. Section 373.4136, Florida Statutes, is
17 created to read:

18 373.4136 Establishment and operation of mitigation
19 banks.--

20 (1) MITIGATION BANK PERMITS.--The department and the
21 water management districts may require permits to authorize
22 the establishment and use of mitigation banks. A mitigation
23 bank permit shall also constitute authorization to construct,
24 alter, operate, maintain, abandon, or repair any surface water
25 management system necessary to establish and operate the
26 mitigation bank. To obtain a mitigation bank permit, the
27 applicant must provide reasonable assurance that:

28 (a) The proposed mitigation bank will improve
29 ecological conditions of the regional watershed;
30
31

(b) The proposed mitigation bank will provide viable and sustainable ecological and hydrological functions for the proposed mitigation service area;

(c) The proposed mitigation bank will be effectively managed in perpetuity;

(d) The proposed mitigation bank will not destroy areas with high ecological value;

(e) The proposed mitigation bank will achieve mitigation success;

(f) The proposed mitigation bank will be adjacent to lands that will not adversely affect the perpetual viability of the mitigation bank due to unsuitable land uses or conditions;

(g) Any surface water management system to be constructed, altered, operated, maintained, abandoned, or removed within the mitigation bank will meet the requirements of this part and the rules adopted thereunder;

(h) It has sufficient legal or equitable interest in the property to ensure perpetual protection and management of the land within a mitigation bank; and

(i) It can meet the financial responsibility requirements prescribed for mitigation banks.

(2) MITIGATION BANK PHASES.--A mitigation bank may be established and operated in phases if each phase independently meets the requirements for the establishment and operation of a mitigation bank. The number of mitigation credits assigned to a phase of a mitigation bank may be less than would be assigned to that phase upon completion of all phases of the mitigation bank. In such case, the department or water management districts shall increase the number of mitigation credits awarded to subsequent phases of the mitigation bank.

(3) ADDITION OF LANDS.--The department or water management district shall authorize the addition of land to a permitted mitigation bank when it is appropriate to do so and the addition of the land results in an increase in the ecological value of the existing mitigation bank. Any such addition shall be accomplished through a modification to the permit which reflects the corresponding increase in the total number of mitigation credits assigned to the bank.

(4) MITIGATION CREDITS.--After evaluating the information submitted by the applicant for a mitigation bank permit and assessing the proposed mitigation bank pursuant to the criteria in this section, the department or water management district shall award a number of mitigation credits to a proposed mitigation bank or phase of such mitigation bank. An entity establishing and operating a mitigation bank may apply to modify the mitigation bank permit to seek the award of additional mitigation credits if the mitigation bank results in an additional increase in ecological value over the value contemplated at the time of the original permit issuance, or the most recent modification thereto involving the number of credits awarded. The number of credits awarded shall be based on the degree of improvement in ecological value expected to result from the establishment and operation of the mitigation bank as determined using a functional assessment methodology. In determining the degree of improvement in ecological value, each of the following factors, at a minimum, shall be evaluated:

(a) The extent to which target hydrologic regimes can be achieved and maintained.

(b) The extent to which management activities promote natural ecological conditions, such as natural fire patterns.

1 (g) The proximity of the mitigation bank to areas with
 2 regionally significant ecological resources or habitats, such
 3 as national or state parks, Outstanding National Resource
 4 Waters and associated watersheds, Outstanding Florida Waters
 5 and associated watersheds, and lands acquired through
 6 governmental or nonprofit land acquisition programs for
 7 environmental conservation; and the extent to which the
 8 mitigation bank establishes corridors for fish, wildlife or
 9 listed species to those resources or habitats.

10 (d) The quality and quantity of wetland or upland
 11 restoration, enhancement, preservation, or creation.

12 (e) The ecological and hydrological relationship
 13 between wetlands and uplands in the mitigation bank.

14 (f) The extent to which the mitigation bank provides
 15 habitat for fish and wildlife, especially habitat for species
 16 listed as threatened, endangered, or of special concern, or
 17 provides habitats that are unique for that mitigation service
 18 area.

19 (g) The extent to which the lands that are to be
 20 preserved are already protected by existing state, local, or
 21 federal regulations or land use restrictions.

22 (h) The extent to which lands to be preserved would be
 23 adversely affected if they were not preserved.

24 (i) Any special designation or classification of the
 25 affected waters and lands.

26 (5) SCHEDULE FOR CREDIT RELEASE.--After awarding
 27 mitigation credits to a mitigation bank, the department or the
 28 water management district shall set forth a schedule for the
 29 release of those credits in the mitigation bank permit. A
 30 mitigation credit that has been released may be sold or used
 31

1 to offset adverse impacts from an activity regulated under
 2 this part.

3 (a) The department or the water management district
 4 shall allow a portion of the mitigation credits awarded to a
 5 mitigation bank to be released for sale use prior to
 6 meeting all of the performance criteria specified in the
 7 mitigation bank permit. The department or the water
 8 management district shall allow release of all of a mitigation
 9 bank's awarded mitigation credits only after the bank meets
 10 the mitigation success criteria specified in the permit.

11 (b) The number of credits and schedule for release
 12 shall be determined by the department or water management
 13 district based upon the performance criteria for the
 14 mitigation bank and the success criteria for each mitigation
 15 activity. The release schedule for a specific mitigation bank
 16 or phase thereof shall be related to the actions required to
 17 implement the bank, such as site protection, site preparation,
 18 earthwork, removal of wastes, planting, removal or control of
 19 nuisance and exotic species, installation of structures, and
 20 annual monitoring and management requirements for success. In
 21 determining the specific release schedule for a bank, the
 22 department or water management district shall consider, at a
 23 minimum, the following factors:

24 1. Whether the mitigation consists solely of
 25 preservation or includes other types of mitigation.

26 2. The length of time anticipated to be required
 27 before a determination of success can be achieved.

28 3. The ecological value to be gained from each action
 29 required to implement the bank.

30 4. The financial expenditure required for each action
 31 to implement the bank.

1 (c) Notwithstanding the provisions of this subsection,
 2 no credit shall be released for freshwater wetland creation
 3 until the success criteria included in the mitigation bank
 4 permit are met.

5 (d) The withdrawal of mitigation credits from a
 6 mitigation bank shall be accomplished as a minor modification
 7 of the mitigation bank permit. A processing fee shall not be
 8 required by the department or water management district for
 9 this minor modification.

10 (6) MITIGATION SERVICE AREA.--The department or water
 11 management district shall establish a mitigation service area
 12 for each mitigation bank permit. The department or water
 13 management district shall notify and consider comments
 14 received on the proposed mitigation service area from each
 15 local government within the proposed mitigation service area
 16 that operates a wetlands regulatory program. Except as
 17 provided herein, mitigation credits may be withdrawn and used
 18 only to offset adverse impacts in the mitigation service area.
 19 The boundaries of the mitigation service area shall depend
 20 upon the geographic area where the mitigation bank could
 21 reasonably be expected to offset adverse impacts. A
 22 mitigation service area may be larger than the regional
 23 watershed if the mitigation bank provides exceptional
 24 ecological value such that adverse impacts outside the
 25 regional watershed could reasonably be expected to be
 26 adequately offset by the mitigation bank. A mitigation
 27 service area may be smaller than a regional watershed if
 28 adverse impacts throughout the regional watershed cannot
 29 reasonably be expected to be offset by the mitigation bank
 30 because of local ecological or hydrological conditions.
 31 Mitigation service areas may overlap, and mitigation service

1 areas for two or more mitigation banks may be approved for a
 2 regional watershed.

3 (a) In determining the extent to which a mitigation
 4 bank provides exceptional ecological value such that adverse
 5 impacts outside the regional watershed could reasonably be
 6 expected to be adequately offset by the mitigation bank, the
 7 department or the water management district shall consider the
 8 characteristics, size, and location of the mitigation bank
 9 and, at a minimum, the extent to which the mitigation bank:

10 1. Will promote a regional integrated ecological
 11 network;

12 2. Will significantly enhance the water quality or
 13 restoration of an offsite receiving waterbody that is
 14 designated as an Outstanding Florida Water, a Wild and Scenic
 15 River, an aquatic preserve, a water body designated in a plan
 16 adopted pursuant to s. 373.456 of the Surface Water
 17 Improvement and Management Act, or a nationally designated
 18 estuarine preserve;

19 3. Will provide for the long-term viability of
 20 endangered or threatened species or species of special
 21 concern; and

22 4. Is consistent with the objectives of a regional
 23 management plan adopted or endorsed by the department or water
 24 management districts.

25 (b) Once a mitigation bank service area has been
 26 established by the department or a water management district
 27 for a mitigation bank, such service area shall be accepted by
 28 all water management districts, local governments, and the
 29 department.

30 (c) If the requirements in s. 373.4135(1)(b) are met,
 31 the following projects or activities regulated under this part

1 shall be eligible to use a mitigation bank, notwithstanding
 2 the fact that they are not completely located within the
 3 mitigation service area.

4 1. Projects with adverse impacts partially located
 5 within the mitigation service area.

6 2. Linear projects, such as roadways, transmission
 7 lines, distribution lines, pipelines, or railways.

8 3. Projects with total adverse impacts of less than
 9 one acre in size.

10 (7) ACCOUNTING.--The department or the water
 11 management district shall provide for the accounting of the
 12 award, release, and use of mitigation credits from a
 13 mitigation bank.

14 (8) AUTHORITY OF LOCAL GOVERNMENTS.--Local governments
 15 may not require permits or otherwise impose regulations
 16 governing the operation of a mitigation bank. However, this
 17 section shall not be construed to limit the authority of a
 18 local government to require an applicant for a mitigation bank
 19 to obtain any authorization required by a local ordinance for
 20 the construction activities associated with a mitigation bank.

21 (9) PRIOR APPLICATIONS.--An application for a
 22 mitigation bank conceptual approval or mitigation bank permit
 23 which is pending with, and determined complete by, the
 24 department or a water management district on or before the
 25 effective date of this act, or a mitigation bank conceptual
 26 approval or mitigation bank permit issued on or before the
 27 effective date of this act, shall continue to be subject to
 28 the rules adopted pursuant to s. 373.4135 which were in effect
 29 on the effective date of this act, unless the applicant or
 30 permittee elects to be subject to the rules governing
 31 mitigation banks adopted after that date.

1 (10) MODIFICATION WITH RESPECT TO PRIOR
 2 APPLICATIONS.--Any application for a modification of a
 3 mitigation bank conceptual approval or mitigation bank permit
 4 which was pending with, and determined complete by, the
 5 department or water management district on or before the
 6 effective date of this act, shall continue to be subject to
 7 the rules adopted pursuant to s. 373.4135 in effect on the
 8 effective date of this act, unless the permittee elects to be
 9 subject to the rules governing mitigation banks adopted after
 10 that date. Any modification to a mitigation bank conceptual
 11 approval or mitigation bank permit issued on or before the
 12 effective date of this act, which is applied for within 20
 13 years of the effective date of this act, and which does not
 14 involve the addition of new land that was not previously
 15 included in the mitigation bank conceptual approval or
 16 mitigation bank permit, shall be subject to the rules adopted
 17 pursuant to s. 373.4135 which were in effect before the
 18 effective date of this act, unless the permittee elects to be
 19 subject to the rules governing mitigation banks adopted after
 20 that date.

21 (11) RULES.--The department and water management
 22 district may adopt rules to implement the provisions of s.
 23 373.4135 and s. 373.4136, which shall include, but not be
 24 limited to, provisions:

25 (a) Requiring financial responsibility for the
 26 construction, operation, and long-term management of a
 27 mitigation bank;

28 (b) For the perpetual protection and management of
 29 mitigation banks; and

30 (c) Establishing a system and methodology for the
 31 valuation, assessment, and award of mitigation credits.

1 Section 8. This act shall take effect upon becoming a
2 law.

3 Section 9. This act shall take effect July 1, 1996.
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Appendix D - Basic Outline of a Federal Mitigation Banking Instrument

OUTLINE OF A FEDERAL MITIGATION BANKING INSTRUMENT

Jacksonville District Corps of Engineers

COVER PAGE

- ☐ Purpose of the document.
- ☐ Title of document and official name of bank.
- ☐ List of signatories.
- ☐ Effective date.

I. PREAMBLE

- ☐ Purpose of bank and its relationship to Corps (or NRCS) and state regulatory programs.
- ☐ Project description (Bank size and classes of wetlands and/or other aquatic resources).
- ☐ Location and size of bank, ownership, and identity of bank sponsor.
- ☐ Baseline conditions.
- ☐ Establishment and use of credits.
- ☐ Type of bank (e.g. single client, general use, joint-project proprietary); identity of sponsor.
- ☐ Makeup, role, and responsibility of the MBRT.
- ☐ List of exhibits, including all appropriate supporting technical plans and documents.

II. ESTABLISHMENT OF THE BANK

- ☐ Mitigation Plan (Description of work to be done).
- ☐ Implementation timetable.
- ☐ Type of real estate interest to be secured by the sponsor.
- ☐ Financial assurances to be secured by the sponsor.
- ☐ As-built reports.

III. OPERATION OF THE BANK

- ☐ Service area.
- ☐ Types of projects or activities that may use the bank.
- ☐ Assessment methodology.
- ☐ Success criteria.
- ☐ Procedures for release of financial assurance.
- ☐ Schedule of credit availability.
- ☐ Provisions for site audits by MBRT.
- ☐ Conditions on debiting.
- ☐ Provisions covering use of the land (incompatible activities), transfer of ownership of the bank lands and/or easements.

IV. MAINTENANCE AND MONITORING

- ☐ Maintenance provisions (brief description of maintenance activities, maintenance periods, duration, responsibility of long-term maintenance and preservation of bank in perpetuity).
- ☐ Monitoring provisions (monitoring methods, frequency, period).
- ☐ Reports and record keeping.
- ☐ Accounting procedure.
- ☐ Contingency plans/remedial actions.
- ☐ Long-term management responsibilities.

V. RESPONSIBILITIES OF MBRT

- ☐ Oversight.
- ☐ Review of reports.
- ☐ Compliance inspections.

VI. OTHER PROVISIONS

- ☐ Force majeure clause (identification of catastrophic events beyond sponsor's control).
- ☐ Dispute resolution.
- ☐ Provisions pertaining to validity, modification, and termination of the Banking Instrument.

VII. DEFINITION OF TERMS

VIII. SIGNATURE PAGE

INTERAGENCY POLICY COORDINATION COMMITTEE (IPCC) PROCEDURE FOR PROPOSED MITIGATION BANKS IN FLORIDA

Background: To streamline the evaluation of mitigation bank proposals in Florida, State and Federal permitting and resource protection agencies have agreed to work together through the joint State/Federal Mitigation Bank Review Team (MBRT) process. The joint process is designed to evaluate the technical aspects of mitigation banking through a team approach. Experience to date has shown that during the technical evaluation of certain mitigation banking proposals, policy issues have been raised that require detailed coordination of policy level decision makers of the respective agencies. It is important these potential policy conflicts be identified and discussed at an early stage so that the permitting and natural resource agencies, as well as the applicants, have a full understanding of the implications of these mitigation banking proposals. To resolve these policy conflicts, an Interagency Policy Coordination Committee (IPCC) may be convened.

The Interagency Policy Coordination Committee (IPCC) may include mid-level supervisors up to top-level executives. This committee may convene a meeting of the appropriate agency representatives or coordinate via a conference call or other forms of communication.

Purpose: The purpose of this procedure is to provide a mechanism for the early identification of mitigation bank proposals that may require special handling in terms of agency policy interpretation and/or special interagency coordination. Projects that are identified through this procedure as requiring policy interpretation and/or special study should not be reviewed for technical sufficiency until the identified issues are resolved. This will prevent not only the MBRT but the applicant from expending valuable staff and fiscal resources on proposals that are unlikely to be authorized.

EACH OF THE FOLLOWING POLICY ISSUES MUST BE CONSIDERED FOR EACH MITIGATION BANK PROPOSAL:

- I. **PRESERVATION IS THE SOLE BASIS FOR GENERATING CREDITS IN THE BANK.**
- II. **THE BANK IS WHOLLY OR PARTIALLY SITED ON PUBLIC LANDS.**
- III. **THE BANK HAS A NEXUS TO A PUBLIC PROJECT.**
- IV. **THE BANK SUPPLANTS A PUBLIC PROJECT PLANNED OR IN PLACE.**

I. PRESERVATION IS THE SOLE BASIS FOR GENERATING CREDITS IN THE BANK

Preservation is not the sole basis for generating credits.....go to II.

In accordance with federal policy on compensatory mitigation for wetland impacts, the preservation of existing wetlands and/or other aquatic resources in perpetuity may be authorized as the sole basis for generating credits in mitigation banks only in exceptional circumstances. In

determining whether preservation is appropriate as the sole basis for generating credits, careful judgment is required regarding a number of factors. Consideration must be given to whether wetlands and/or other aquatic resource proposed for preservation perform physical, chemical, or biological functions, the preservation of which is important to the region in which the aquatic resources are located, are under demonstrable threat of loss or substantial degradation due to human activities that might not otherwise be expected to be restricted. The existence of a demonstrable threat will be based on clear evidence of destructive land use changes which are consistent with local and regional land use trends and are not the consequence of actions under the control of the bank sponsor.

Policy Consideration: The IPCC must determine if the mitigation bank proposal qualifies as an exceptional circumstance when preservation is the sole basis for generating credits and where the wetlands or other aquatic resource proposed for preservation perform functions important to the region and are under demonstrable threat.

Further study or input by experts may be necessary prior to the IPCC determination. Based on interagency coordination and the recommendations of respective staff and/or the specialized study team the IPCC determines:

The proposal constitutes an exceptional
circumstance.....go to II.

The proposal does not constitute an exceptional circumstance and is therefore
inappropriate.

II. THE BANK IS WHOLLY OR PARTIALLY SITED ON PUBLIC LANDS.

The proposed bank is not wholly, or partially, sited on public
lands..... go to III.

To aid the MBRT in determining whether the bank proposal is consistent with each agency's policy on mitigation on public land, the agencies are encouraged to develop guidance, either singly or jointly, on this issue.

In February 1997, the Board of Trustees (BOT) enacted a one-year moratorium on the establishment of mitigation banks on BOT lands. In May 1998, the BOT decided not to allow any mitigation banking on BOT-owned lands. Therefore, banks sited on BOT lands need not be considered by the MBRT or IPCC.

Policy Consideration: The IPCC must determine if the mitigation bank proposal conforms with the joint or individual policies of the IPCC and/or agency which owns or manages the subject lands.

Further study or input by experts may be necessary prior to the IPCC determination. Based on interagency coordination and the recommendations of respective staff and/or the specialized study team the IPCC determines:

The proposal is consistent with the agency's public land policies.....go to III.

The proposal is not consistent with the agency's public land policies and is therefore inappropriate.

III. THE BANK HAS A NEXUS TO A PUBLIC PROJECT.

The proposed bank does not have a nexus to a public project..... go to IV.

The siting of mitigation banks in locations which further the goals of ecosystems or watershed management plans is encouraged. Many times it will be advantageous from an ecosystem perspective to site a mitigation bank adjacent to existing conservation lands. It must be remembered however, that there may be operational issues associated with the public project which could be incompatible with those of a mitigation bank. In most of these cases, input will be needed from specialists involved with the public project to help the MBRT determine if establishment of a mitigation bank in conjunction with the public project would be appropriate.

In cases where it is determined that a mitigation bank is compatible with the operational and long-term management goals of the public project, it must also be remembered that credit may only be given to the bank for activities undertaken in conjunction with, *but supplemental to*, such programs in order to maximize the overall ecological benefit of the project. Determining where the benefits of the public program end, so that accounting of the benefits of the mitigation bank can begin, can be difficult.

Policy Consideration: The IPCC must determine if the mitigation bank is operationally compatible, now and in the future with the public project.

In most instances, further study or input by experts will be necessary for the IPCC to make its determination. Based on interagency coordination and the recommendations of respective staff and/or the specialized study team the IPCC determines:

The proposal is compatible with the public project..... go to IV.

The proposal is not compatible with the public project and is therefore inappropriate.

IV. THE BANK SUPPLANTS A PUBLIC PROJECT PLANNED OR IN PLACE.

The proposed bank would not supplant a planned or in place public project..... go to V.

The following narrative is a consideration only under Federal requirements for the evaluation of mitigation banks. Tightening fiscal resources are driving new and innovative approaches to accomplish much needed environmental restoration and conservation projects. Clearly, mitigation banking can play an important role. However, it must be recognized that the net effect to the environment will differ depending upon the method through which a given restoration or conservation project is accomplished. By definition, the ecological benefits of a mitigation bank are offset by the incremental losses for which the bank was established to mitigate; a zero-sum gain for the environment. On the other hand, if the same project were accomplished by a public agency for the express purpose of improving the environment in the long-term, the ecological benefits would accrue indefinitely; a true net gain. Therefore, whenever a mitigation bank supplants a public effort the result is a loss of that potential net improvement. In view of the extensive and varied restoration and preservation efforts at all levels of government in Florida, determining which public programs should not be supplanted by mitigation banks can be a controversial question requiring close interagency coordination.

Note also that the prohibition on mitigation banks on BOT-owned lands, as discussed in II, above, excludes projects on BOT-owned lands from these considerations.

Policy Consideration: The IPCC must determine if the mitigation bank proposal would supplant an environmental improvement or conservation project already planned or in place by a public agency.

Further study or input by experts may be necessary prior to the IPCC determination. Based on interagency coordination and the recommendations of respective staff and/or the specialized study team the IPCC determines:

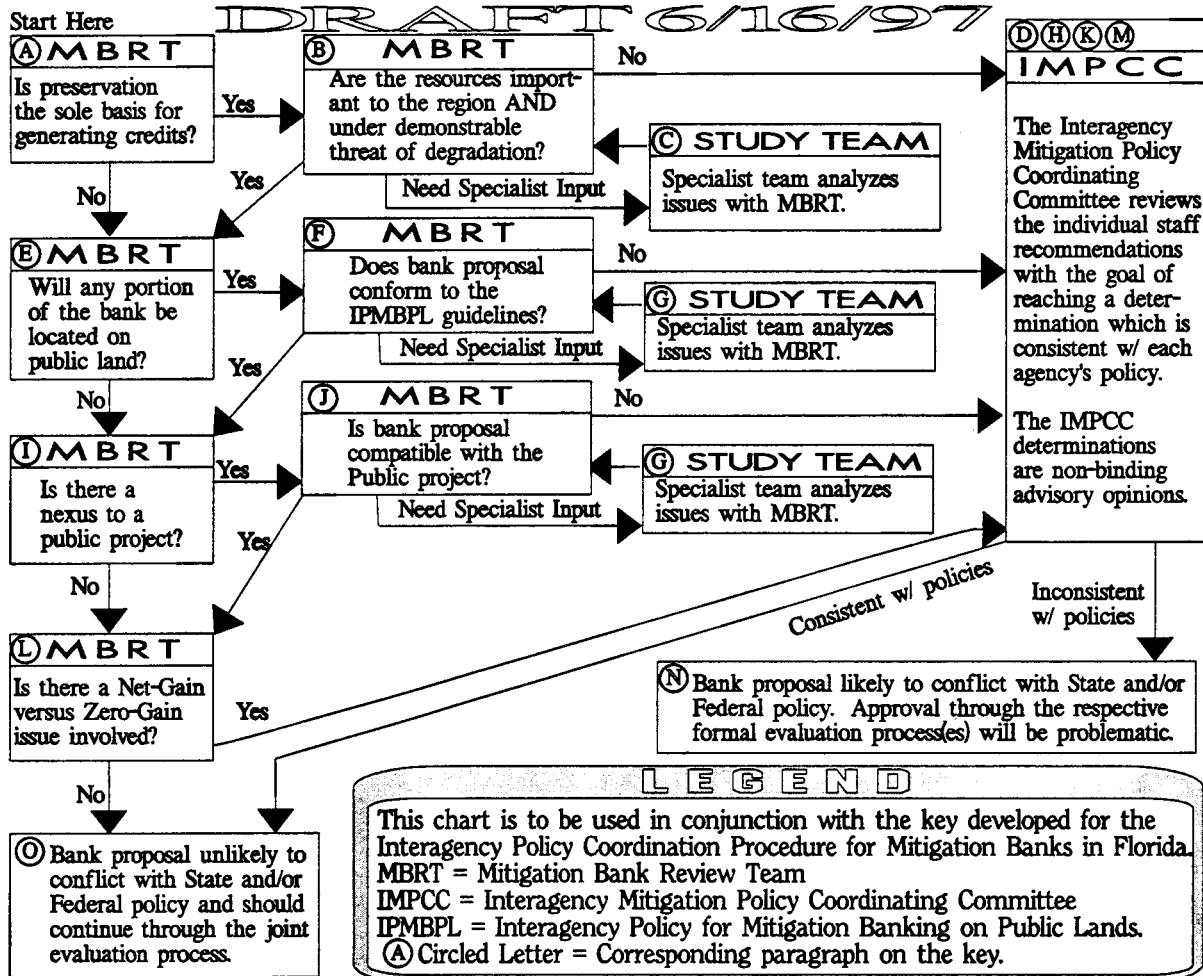
The proposed bank would not supplant a pre-existing or planned public effort.....go to V.

The proposal results in a net-loss to the environment and is therefore inappropriate.

V. FURTHER REVIEW OF MITIGATION BANK PROPOSAL DETERMINED.

If the IPCC determined that the mitigation bank proposal was inappropriate for one, or more, of the above policy considerations, the MBRT will not resume technical review of the project. The MBRT chair notifies the prospective banker that the IPCC has determined that the proposed mitigation bank is inappropriate and would not likely be authorized.

If the IPCC did not identify any policy conflicts with the mitigation bank proposal, the MBRT continues with its technical review of the mitigation bank proposal utilizing guidance from the IPCC and any findings of study teams formed during the IPCC process.



TEMPORAL FACTOR FOR MITIGATION BANKING (DERIVATION)

Step 1. Recall the formula found immediately after the figure on page 5c-3: $T1 = (\text{area of polygon CDBC}) / (\text{area of polygon CDAC})$. This formula can be re-expressed as $T1 = (\text{the "actual" mitigation stream of benefits}) / (\text{the "perfect" mitigation stream of benefits})$.

Step 2. For the following steps, we are going to re-express the functional capacity (FC) in terms of an absolute scale ranging from 0.0 to 1.0. Therefore, the functional capacity of the mitigation site at the time of credit release (C_R) as $FC=0.0$. Functional capacity starts at zero ($FC=0.0$) because all of the stream of benefits that are multiplied by $T1$ are those benefits that are based on the "growth" of functional capacity that occurs after the time of credit release. The maximum predicted capacity is a result of the construction and management activities (C_P) as $FC=1.0$.

Step 3. To visualize the "perfect" mitigation, at time zero (T_R in the diagram on page 5c-3), start with a one acre parking lot with the functional capacity (FC) of zero ($FC=0.0$). This is point "d" on the diagram above. Time zero is January 1st of Year 1 of the mitigation polygon. During year 1, the parking lot is removed and planted and reaches maximum capacity ($FC=1.0$) by the end of year 1. (Editorial note: The formula at the top of 5c-3 refers to a "forested" system but here the mitigation grows in one year! Please accept for purposes of this example these could be exceptionally fast growing trees.) This is point "a" on the diagram. The benefit received in year 1 and every year thereafter until the planning horizon (T_{max}) is 1.0 units per year, for a total of 70 unit-years/acre.

Year	1	2	3	4	5	---	70	Total
a =	1.000	1.000	1.000	1.000	1.000	---	1.000	70.00 Unit-
Unit/acre								0 years/acre

Step 4. The standard technique is to express these 70 units as an equivalent present worth (PW) number. The PW is based on discounting (reducing) the benefit received in future year. We will use, as described by King et al. (Appendix G), a discount rate of 7.38% per year. The discount formula is $PW = (FC \text{ in year } t) * (1.0738)^t$. The PW of the "perfect" mitigation stream of benefits is therefore 13.460 PW-unit-years/acre.

Year	1	2	3	4	5	---	70	Total
a =	1.000	1.000	1.000	1.000	1.000	---	1.000	70.000 unit-
Unit/acre								years/acre
b =	0.931	0.867	0.808	0.752	0.700	---	0.007	
Discount								
a x b =	0.931	0.867	0.808	0.752	0.700	---	0.007	13.460 PW-unit-
PW								years/acre

Step 5. Now to calculate the "actual" mitigation stream of benefits. Presume the same parking lot (FC=0.0) that is planted in year 1. This is point "d" on the diagram. However, now the applicant presumes that the plants will take three years to grow to full maturity. This is point "b" on the diagram. Some function will be present and some growth will occur in year 1. The wetland "finishes" growing in year 3 when it reaches FC=1.0. This is point "b" on the diagram. From the table below, the total units per acre received over 70 years is 69.00 unit-years/acre. This is less than the 70 unit-years/acre of the "perfect" mitigation. Applying the discount formula to the stream of benefits results in a PW of 12.547 PW-unit-years/acre compared to the 13.460 PW-unit-years/acre of the theoretically "perfect" mitigation.

	Year	1	2	3	4	5	---	70	Total
a =		0.330	0.670	1.000	1.000	1.000	---	1.000	69.000 unit-
Unit/acre									years/acre
b =		0.931	0.867	0.808	0.752	0.700	---	0.007	
Discount									
a x b =		0.310	0.578	0.808	0.752	0.700	---	0.007	12.547 PW-unit-
PW									years/acre

Step 6. The Temporal Factor (T1) is calculated as follows.

T1 = ("actual" mitigation stream of benefits) divided by ("perfect" mitigation stream of benefits).

T1 = (12.547 PW-unit-years/acre) divided by (13.460 PW-unit-years/acre)

T1 = 0.9324

Step 7. As an example, presume the actual mitigation bank is as follows. References are to the diagram above. First, the mitigation site is a parking lot measuring one acre. In the first year the parking lot is removed and planted. T_0 = begin construction of the bank = 1 and C_R = functional capacity (FC) at beginning = 0.0. No credits are released in the first year. Second, all of the credits will be released during year two and the functional capacity of the immature wetland is expected to be 0.2 on a scale of 0.0 to 1.0. This is point "d" on the diagram. $C_R = 0.2$ and $T_R = 2$. Note that $T_R = 2$ because the credits are released in Year 2, even though the bank construction started in Year 1 ($T_0 = 1$). Third, the plants will continue to grow until reaching full maturity four years after planting. Full maturity is expected to provide a functional capacity of 0.8 on a scale of 0.0 to 1.0. (Note: a FC less than 1.0 will occur because the absolute scale for a region will assign 1.0 to a pristine wetland in an ideal situation whereas the mitigation site may have less than ideal circumstances.) This is point "b" on the diagram. $C_P = 0.8$ and $T_P = 4$. Fourth, the management plan is expected to be implemented that will maintain the full maturity (FC=0.80) for the planning horizon of 70 years. Fifth, the total number of units released during year 2 (T_R), that is the year following the year the construction and planting work was performed, is calculated as follows. Recall that the calculation was presented in the example of the forested mitigation above: Units = $[(C_P - C_{R\text{-forested}}) * T1 * \text{Acres}] + [(C_{R\text{-forested}} - C_0) * \text{Acres}_{\text{forested}}]$.

$$C_R = \text{Units Released in year } T_R = [(C_P - C_R) * T_1 * \text{Acres}] + [(C_R - C_0) * \text{Acres}].$$

Substituting the values for the variables (the T_1 comes from Step 6 of its derivation above),

$$C_R = \text{Units Released in year 2} = [(0.9 - 0.2) * 0.9324 * 1.0 \text{ acre}] + [(0.2 - 0.0) * 1.0 \text{ acre}].$$

$$C_R = \text{Units Released in year 2} = [0.5594] + [0.20] = 0.7594$$

Step 7a. Additional remark on Step 7. The number of units calculated in Step 7 is for a single mitigation polygon. A typical bank consists of several mitigation polygons. The C_R (Units Released in year 2) will be calculated for each of these polygons and the C_R 's added together for the grand total of the number of units released in year 2 by the bank.

Step 7b. Additional remark on Step 7. If the banker prefers to release some units in year 2, then some more units in year 4, for example, then some polygons will be identified for year 2 and the remainder identified for year 4. Then the calculation of C_R for each polygon can be made using the appropriate T_R (year of release). The C_R 's for year 2 would be added together for the number of units released in year 2 and the C_R 's for year 4 would be added together for the number of units released in year 4. The two totals should not be added together for a grand total.

Step 7c. Additional remark on Step 7. The formula presented by King, et al (Appendix G) takes the "future" benefit (that is, that received in a later year) and calculates the smaller "Present Worth" through the use of the discount formula (7.38% per year). However, the formula also takes any "past" benefit (that is, any increase in functional capacity that was achieved in a year prior to the year of the impact occurred) and calculates a larger "Present Worth". One of the fundamental premises of mitigation banking is that credits are available for release after the functional capacity increase has been achieved. Therefore, during the year(s) between the initiation of the construction and management activities of the mitigation bank (T_0) and the Credit Release (T_R), the banking agreement can be written to provide for periodic release of credits equal to the actual (observed) increase in functional capacity. Except for unusual circumstances, the discount formula will not be used to calculate an increase in the number of credits available for release even if the release is "held" or delayed to some year after the actual (observed) functional capacity increase. The purpose of the derivation of the Temporal Lag Factor is to establish a mechanism to provide for a release of credits based on the increases in functional capacity that have not yet occurred (that is, the functional capacity earned after the Credit Release year, T_R).

Step 8. If the nature of the mitigation work warrants, the construction of the bank will be phased and one or more polygons may actually start construction after the date of the release of credits. For example, we will continue the example we left off at Step 7 above, except now the construction and planting will not occur until year 2. Therefore, there is no benefit received during the first year. The Temporal Loss Factor = $T_1 = (\text{"actual" mitigation stream of benefits}) / (\text{"perfect" mitigation stream of benefits}) = (11.679 \text{ PW-unit-years/acre}) / (13.460 \text{ PW-unit-years/acre}) = 0.8678$

Year	1	2	3	4	5	---	70	Total
a =	0	0.330	0.670	1.000	1.000	---	1.000	68.000 unit-
Unit/acre								years/acre
b =	0.931	0.867	0.808	0.752	0.700	---	0.007	
Discount								
a x b =	0.000	0.289	0.538	0.752	0.700	---	0.007	11.679 PW-unit-
PW								years/acre

Step 9. All the calculations so far use the variable T1 for temporal loss that occurs after the year the credits are released. The project manager must perform a separate calculation for: (1) the credits "earned" prior to the year of the release; and (2) the credits "earned" after the year of release. However, this mathematical burden can be simplified to a single variable for Temporal Lag (T).

From Step 7, the formula is

$$C_R = \text{Units Released in year } T_R = [(C_P - C_R) * T1 * \text{Acres}] + [(C_R - C_O) * \text{Acres}].$$

King et al. briefly discusses that the increase in mitigation function between construction and maturity can be assumption to be linear, that is, the increase in functional capacity is the same in each year. The increase per year is this total expected increase of functional capacity $(C_P - C_O)$ divided by the total number of years from construction to maturity $(T_P - T_O)$.

Therefore, the terms $(C_P - C_R)$ and $(C_R - C_O)$ can be expressed in terms of time.

$$(C_P - C_R) = (C_P - C_O) * [(T_P - T_R) / (T_P - T_O)] \text{ where "/" means "divided by"}$$

$$(C_R - C_O) = (C_P - C_O) * [(T_R - T_O) / (T_P - T_O)]$$

Substituting and simplifying:

$$C_R = (C_P - C_O) * \text{Acres} * \{ [(T_P - T_R) / (T_P - T_O) * T1] + [(T_R - T_O) / (T_P - T_O)] \}$$

Substitute the variable T:

$$C_R = (C_P - C_O) * \text{Acres} * \{T\}$$

Therefore, the Temporal Lag Factor is defined as:

$$T = \text{Temporal Lag Factor} = [(T_P - T_R) / (T_P - T_O) * T1] + [(T_R - T_O) / (T_P - T_O)]$$

Simplifying:

$$T = \text{Temporal Lag Factor} = \{ [(T_P - T_R) * T1] + [(T_R - T_O)] \} / (T_P - T_O)$$